Fermilab

Fermi National Accelerator Laboratory

A Department of Energy National Laboratory

Managed by Universities Research Association

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The Fermilab Ten Year Site Plan (TYSP) describes the current mission and future possibilities at Fermi National Accelerator Laboratory. Under the Department of Energy's Real Property Management (RPAM) Order, DOE O 430.1B, this plan will become Fermilab's planning document that provides annual updates to mission opportunities and resource requirements. The TYSP serves as a single, comprehensive plan addressing how the lab's real property assets support the Department's Strategic Plan, the Secretary's five-year planning guidance, and annual program direction. It supports development of the Integrated Facilities and Infrastructure (IFI) cross cut budget and is part of the annual budget submission. Additionally, the first five years of the TYSP complement the Laboratory's Five Year business plan.

The TYSP integrates functional components of land use, facilities and infrastructure acquisition, maintenance, recapitalization, safety, security, and disposition plans into an all-encompassing site wide management plan. It includes an assessment of past performance and projected future outcomes, and strengthens communication and accountability.

FIGURE 1 – Fermilab Site

In addition to a discussion on current mission, the Fermilab TYSP addresses future mission possibilities as defined in the Fermilab Long-Range Planning Committee 2004 report titled, "The Coming Revolution in Particle Physics." With annual updates, the TYSP serves as the record of Fermilab planning consistent with High Energy Physics program direction that ensures resources are identified and allocated in the most efficient and effective manner. The most recent High Energy Physics program direction included the cancellation of the B-Particle Physics at the Tevatron (BTeV) experiment. This is the single biggest change from the December 2004 TYSP.

The 2005 TYSP presents Fermilab's current mission and associated resource requirements, including the Neutrinos at the Main Injector (NuMI) experiment and other Run II improvements. The future of the lab is described as Fermilab's 2010 and 2020 visions that will include more detailed resource requirement projections as mission planning continues. Furthermore, in acknowledging Fermilab's status as a world-renowned center of research and development on particle accelerator technology, the TYSP solidifies Fermilab's future as the leading U.S. laboratory for hosting particle physics research. The ongoing planning process and associated resource requirements will be satisfied through reuse of existing facilities or with modernization or new construction consistent with sustainability guidelines. These attributes and the flexibility to adjust to new mission needs position Fermilab well in its collaboration with the international network of particle physics laboratories and institutions.

In 1967 the U.S. Atomic Energy Commission, under a bill signed by President Lyndon B. Johnson, commissioned the National Accelerator Laboratory. Renamed on May 11, 1974, in honor of Enrico Fermi, the 1938 Nobel Prize for Physics winner, Fermi National Accelerator Laboratory's primary mission is advancing the understanding of the fundamental nature of matter and energy.

Fermilab is the largest laboratory in the United States dedicated to particle physics. The Tevatron, commissioned in 1983, is four miles in circumference and is the highest energy collider in operation. Housed in a tunnel 30 feet below the ground, a series of accelerators send particles around the Tevatron at 99.9999 percent of the speed of light in a vacuum. As the particles complete the four-mile course nearly 50 thousand times a second, two kinds of particles, protons and antiprotons circulate around the ring in opposite directions. At two points in the ring, streams of particles collide into each other at the rate of almost two million each second. To see these tiny particles, two collider detectors (CDF & DZero), each about four stories high and 5,000 tons, contain instrumentation to study the collisions. Teams of scientists build and operate these detectors.

FIGURE 2 - Construction of the Fermilab Main Ring, the tunnel system for the Tevatron, commenced in 1968

The newest component in the accelerator chain, the Main Injector, was added in 1999. This increased the number of proton-antiproton collisions in the Tevatron, enhancing the chances for important discoveries in Run II. Since it began in March 2001, Run II has involved more than 1,500 particle physicists exploring the unification of forces, the nature of dark matter, and the mysteries of antimatter using the detectors (CDF & DZero) at the Fermilab Tevatron.

In addition to the collider experiments at CDF & DZero, the accelerator complex supports neutrino experiments, experiments with hadron beams and experiments to test new accelerator and detector technologies. All of these activities serve to accomplish the mission of the High Energy Physics (HEP) program to discover and explore the laws of nature as they apply to the basic constituents of matter, and the forces between them. The mission centers on investigations of elementary particles and their interactions, advancing Department of Energy missions and objectives through the development of key cutting-edge technologies and trained manpower.

FIGURE 3 – Dennis Hastert, Speaker of the U.S. House of Representatives, and Dr. Ray Orbach, Director of the Office of Science, at the NuMI/MINOS dedication in March 2005.

Fermilab is situated on a 6,800-acre site thirty miles west of Chicago, on land previously home to farms and the Village of Weston (constructed in the 1960s). Most of the original farm and village structures are still in use by the laboratory for housing, storage and laboratory space. Some of these farm structures are more than one hundred years old. The balance of the site's facilities was built to house people and experiments and is thirty years old or less. *(Figure 5)*

Fermilab's proximity to Chicago allows it to benefit from a major U.S. transportation, educational, cultural and metropolitan hub. The collection of physicists, engineers, and technical staff who operate and improve the accelerator complex is an international community. Approximately 4,000 employees, visitors and users work at Fermilab, many from Universities Research Association (URA) member universities, which has operated Fermilab since its inception. URA, a nonprofit consortium comprised of 90 research-oriented universities from around the world, operates Fermilab for the DOE.

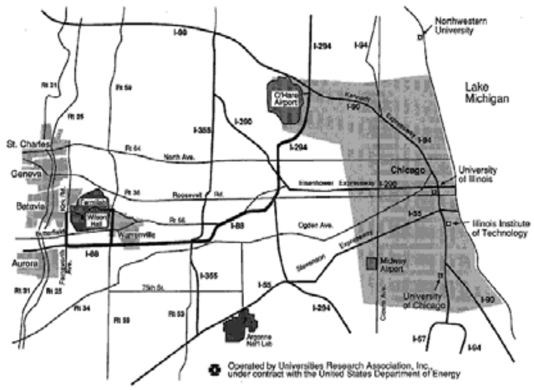
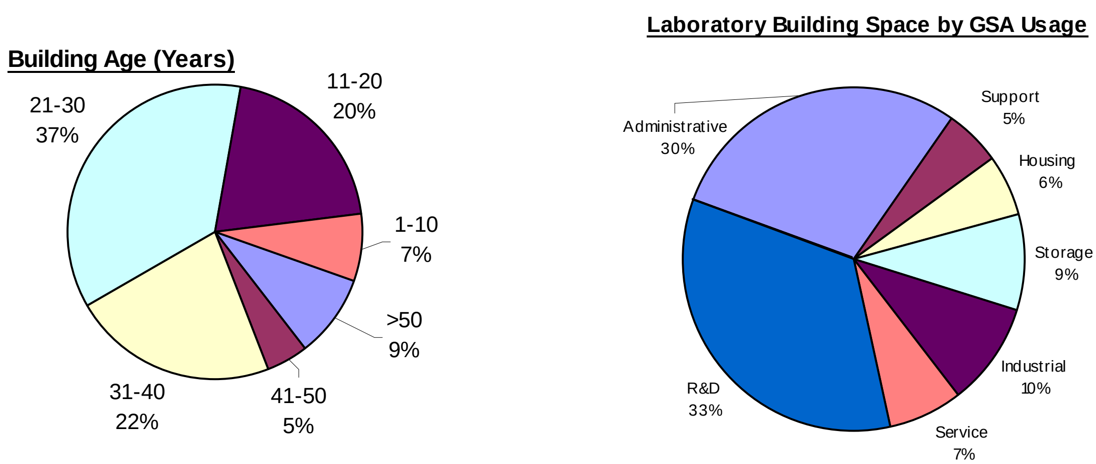


FIGURE 4 – Regional map of Northern Illinois showing metropolitan Chicago & Fermilab.

With 351 buildings comprising 2.3 million gross square feet and miles of utility infrastructure, including electrical, natural gas, pond water systems, potable water and sanitary lines, Fermilab's total real property replacement plant value is $1.3 billion. All of the Laboratory's buildings are DOE-owned and the usage is predominately divided among research and development space and administrative areas *(Figure 6).* The annual operating budget of the laboratory is in the range of $300 million, funded largely by the Office of High Energy Physics (HEP), part of DOE's Office of Science.

FIGURES 5 & 6 – Summary charts of Fermilab Building Ages & Space Usages



A. Introduction

From its founding in 1967, Fermilab's mission has remained to advance the understanding of the fundamental nature of matter and energy, by providing leadership and resources for qualified researchers to conduct research at the frontiers of high-energy physics and related disciplines.

This section of the plan describes Fermilab's core competencies, and the lab's existing scientific operations. The vision for Fermilab in 2010 and 2020 as recently discussed in the Fermilab Director's May 25, 2004, publication, "Discovery at Fermilab: The Next Twenty Years" serves as a roadmap for describing, planning and directing the future of the lab.

B. Core competencies

Fermilab leads the nation in the construction and operation of large facilities for particle physics research, and in developing the underlying technology for high-energy physics research.

The Lab's mission is built on a foundation of six core competencies:

1. Construction and operation of accelerator facilities for particle physics
2. Construction and operation of experimental facilities for particle physics and particle astrophysics
3. Research, design, and development of accelerator technology
4. High-performance scientific computing and networking
5. International scientific collaboration
6. Theoretical particle physics and astrophysics

C. New Initiatives at Fermilab

1. Overarching Goals

   a. Enable the most powerful attack on the fundamental science questions of our time

   b. Provide world class facilities for HEP as part of the global network

   c. Develop science and technology for particle physics and cosmology research

2. Specific Goal: Resolve US crisis of no domestic program beyond 2010:

   a. Recovering the energy frontier through construction of an International Linear Collider

   b. Maintain the foremost neutrino program

   c. Other Neutrino projects: NOvA, proton driver(s)

D. Fermilab Today

WHAT IS THE NATURE OF THE UNIVERSE AND WHAT IS IT MADE OF?
WHAT ARE MATTER, ENERGY, SPACE, AND TIME?
HOW DID WE GET HERE, AND WHERE ARE WE GOING?

Throughout human history, scientific theories and experiments of increasing power and sophistication have addressed these basic questions about the universe. The resulting knowledge has led to revolutionary insights into the nature of the world around us. In the last 30 years, physicists have achieved a profound understanding of the fundamental particles and the physical laws that govern matter, space, and time. Researchers have subjected this "Standard Model" to countless experimental tests; and again and again, its predictions have held true. The series of experimental and theoretical breakthroughs that combined to produce the Standard Model can truly be celebrated as one of the great scientific triumphs of the 20th century.

Now, in a development that some have compared to Copernicus' recognition that the earth is not the center of the solar system, startling new data have revealed that only five percent of the universe is made of normal, visible matter described by the Standard Model. Ninety-five percent of the universe consists of dark matter and dark energy whose fundamental nature is a mystery. The Standard Model's orderly and elegant view of the universe must be incorporated into a deeper theory that can explain the new phenomena. The result will be a revolution in particle physics as dramatic as any that have come before.

From "Quantum Universe, The Revolution in 21st Century Particle Physics, 2004, DOE/NSF and the High Energy Physics Advisory Panel in response to a charge by Dr. Raymond L. Orbach, Director of the Office of Science of U.S. Department of Energy and Dr. Michael Turner, Assistant Director of Mathematics and Physical Science of the National Science Foundation.

Fermilab is the largest particle physics laboratory in the United States. Its scientific program is designed to address key scientific issues as indicated in the report, "Quantum Universe," cited above. The Tevatron collider is the highest energy collider in operation and is the only facility in the world that can now address many of the central questions above. Fermilab's accelerator complex supports the most diverse particle physics program of any laboratory in the country, a program that includes collider experiments, neutrino experiments, experiments with hadron beams, and experiments testing new accelerator and detector technologies.

About 3,000 physicists currently perform research with Fermilab facilities on the most compelling questions in particle physics:

1. Run II of the Tevatron: Over 1,500 particle physicists explore the unification of forces, the nature of dark matter, and the mysteries of antimatter using the CDF and DZero detectors at the Fermilab Tevatron. Measuring the mass of the top quark and the W boson more precisely at the Tevatron will probe whether the Standard Model is showing signs of the new physics ahead. The experiments are exploring new territory in the hunt for extra dimensions, supersymmetry and quark substructure.

2. Research at the Large Hadron Collider will continue exploring the new physics opening up at the energy frontier, U.S. physicists will use Fermilab as the home laboratory for research using the Large Hadron Collider (LHC) at CERN. Fermilab is the research center for the collaboration of 400 physicists from U.S. institutions looking for discoveries at the energy frontier with data from the CMS experiment at the LHC. It is also the host laboratory for the collaboration of accelerator physicists from three laboratories building accelerator technology for and doing accelerator research with the Large Hadron Collider.

3. Neutrino physics: About 250 physicists conduct research at Fermilab using the only two neutrino beamlines operating in the U.S. The MiniBooNE experiment is looking for exotic neutrinos using a low-energy neutrino beam from the Fermilab Booster. The MINOS experiment's 5,400-ton Far Detector, sited more than 400 miles northwest of Fermilab in the Soudan mine in northern Minnesota (Figure 7), will measure the evolution of neutrinos produced by the Fermilab Main Injector. NuMI's 980-ton near detector at Fermilab will also be used to study neutrino oscillations. In addition, smaller experiments are being proposed to study nuclear structure with neutrinos, using both existing beams.

FIGURE 7 - MINOS (Main Injector Neutrino Oscillation Search), a long-baseline neutrino experiment to observe neutrino oscillations, uses two detectors, one at Fermilab and one at the Soudan Underground Mine State Park in Minnesota.

4. Particle Astrophysics: Fermilab was the first particle physics laboratory to establish a group dedicated to the exploration of the exciting science at the convergence of particle physics and astrophysics. The laboratory builds and operates experiments for three large collaborations, whose membership totals about 650 scientists doing research in particle astrophysics. The Sloan Digital Sky Survey, a continuing source of astronomical discoveries, has been used with NASA's Wilkinson Microwave Anisotropy Probe mission to pin down the amount of dark matter and dark energy in the universe. The Cryogenic Dark

Matter Search, operating in the Soudan mine, is the leading experiment in searching for direct evidence of the Dark Matter halo and its interactions with normal matter. The Auger Cosmic Ray Observatory, in the high Argentine desert, is the largest array of detectors in the world observing cosmic rays.

All of these experimental programs are unique, and all are recognized as essential components of the world program in particle physics. Fermilab is the leading U.S. laboratory studying unification with colliders and the only one studying neutrinos with accelerators.

E. Fermilab's leadership role

The system of seven accelerators at Fermilab (Figure 8) provides a uniquely diverse and flexible platform for doing experiments across the spectrum of particle physics. As a result, the array of experiments operating at the Fermilab accelerators covers the widest possible range of physics at any U.S. laboratory, and the community of scientists doing research with them is the largest. The collection of physicists, engineers, and technical staff who operate and improve the accelerator complex is an asset of incalculable value in planning the future. Finally, the large Fermilab site and its

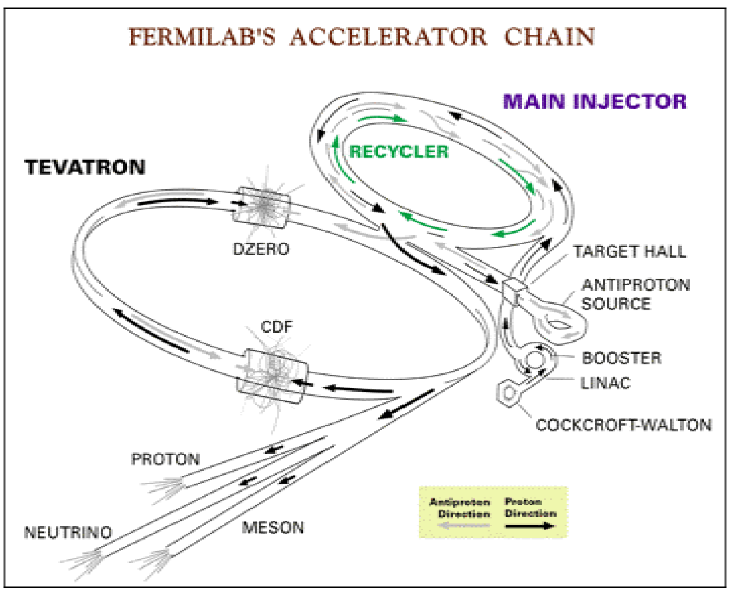


FIGURE 8 - Physics at Fermilab is accomplished with a chain of accelerators, both linear and circular. These accelerators produce collisions at CDF & DZero.

surroundings provide an excellent physical environment for building large new accelerators of any particle physics laboratory in the world. Fermilab is also a world-renowned center of research and development on accelerator technologies, such as superconducting magnets. For all of these reasons, Fermilab is and will remain the leading U.S. laboratory for hosting particle physics with accelerators. At the same time, all of the major future projects at Fermilab will be collaborative efforts within international network of particle physics laboratories and institutes

F. Fermilab in 2010

By the year 2010, particle physics is likely to be in the midst of the revolution. New data from the Large Hadron Collider (LHC) at CERN in Switzerland will show signs of whatever new physics – extra dimensions, supersymmetry, one or more Higgs bosons

– shows up at the TeV mass scale. A new round of neutrino experiments will have completed the first major step in understanding the nature of neutrino mass. If dark matter is due to supersymmetric particles, physicists should have observed their interactions underground and produced them in colliders. All of these new discoveries and measurements will lead to a new round of experiments to understand the underlying physics.

While the LHC will represent the energy frontier in 2010, the Fermilab accelerator complex will remain a unique platform for particle physics experiments. Fermilab will continue to be responsible for a large fraction of the U.S. program in particle physics at this time, with a central role in three of the five major facilities operating in 2010 that are discussed in the High Energy Physics Advisory Panel's *The Quantum Universe*:

1. The LHC will be addressing the most important questions in particle physics at the energy frontier, and Fermilab is the lead laboratory for the U.S. efforts on the LHC's Compact Muon Solenoid (CMS) experiment and on the accelerator.
2. A number of experiments, including MINOS, use the Fermilab neutrino beams to expand our understanding of neutrinos.

FIGURE 9 - The MiniBooNE experiment tests for neutrino mass by searching for neutrino oscillations, which may lead to physics beyond the Standard Model.

Fermilab will also be host to a significant part of the U.S. program in Particle Astrophysics. An expanded and upgraded Cryogenic Dark Matter Search (CDMS) experiment will extend its investigation of the nature of dark matter; the Auger cosmic ray observatory will start to operate a second array in North America, in addition to the one in Argentina. The Dark Energy Survey, based on a large new state-of-the-art camera built at Fermilab and mounted on the telescope at Chile's Cerro Tololo, could be making first observations. Finally, Fermilab will be working with lead laboratory Lawrence Berkeley National Laboratory and other laboratories in building the Joint Dark Energy Mission.

In the next decade the particle physics facility most likely to make revolutionary discoveries is the LHC, and Fermilab will play a critical role in enabling U.S. scientists to take full advantage of it. Given worldwide networks and grid computing, particle accelerators and research centers no longer need to be sited together. The critical features for a world-leading research center on LHC physics are the power of the computing infrastructure, the expertise of the support staff, and the concentration of intellectual talent leading the research. As the center of research with hadron colliders for the last twenty years, Fermilab is in an ideal situation to maintain research leadership for U.S. particle physics in the LHC era.

For the LHC experiment Compact Muon Solenoid (CMS), the data will be taken at Switzerland's CERN but the American physicists plan to do most of their research closer to their home universities. This motivates Fermilab to establish the LHC Physics Center at Fermilab, which is being planned along with university physicists. The Center will allow American universities and laboratories to get full scientific benefits from the investments the U.S. is making in the LHC. U.S. accelerator physicists will also develop their expertise in forefront accelerator technology while improving the scientific power of the LHC as a result of the accelerator research program centered at Fermilab. The LHC-directed research effort at Fermilab will be as large as that associated with one of the two current Tevatron collider experiments.

The most important role for Fermilab in this decade will be preparing to build a new accelerator facility in the next decade.

G. Fermilab in 2020

The overarching vision for Fermilab in 2020 is that it will be the primary site for particle physics accelerators in the U.S.

The Fermilab Long-Range Planning Committee identified two alternative visions for Fermilab in the period 2010 to 2020, depending on the development of the International Linear Collider (ILC), the next worldwide project for particle physics.

The most favorable option for U.S. particle physics is the construction of the International Linear electron-positron Collider with initial energy 0.5 TeV, built sometime in the decade 2011-2020. North America, Europe and Japan have all identified this as the next big project for particle physics because of its unique ability to address the most important issues in the field. Representatives have formed the beginning of a collaboration to create an international laboratory of a novel type. The global ILC laboratory would be funded and managed jointly by national laboratories and their funding agencies in the U.S., Europe and Japan. The countries are not interested in funding a new permanent laboratory in addition to the existing national ones, so it is imperative that the plan make optimum use of the assets residing at the present laboratories.

FIGURE 10 - Fermilab continues R&D and design work on the International Linear Collider, working with other laboratories to manage and organize the project

A critical element in planning the ILC is choosing a site that is geologically suitable, located on or under available land, and at or very close to an existing particle physics laboratory that serves as host. During the long period of building up the infrastructure at the ILC site, it is critical that staff can shuttle between work at the host laboratory and at the ILC on a daily basis. Another requirement is the availability of up to 500 MW of electrical power at an affordable cost. The best site in the world, given all of these constraints, is one within 25 miles of Fermilab. Whether the ILC is sited in the U.S., and specifically in northern Illinois, will be a decision made at the highest level of several governments. From technical and project cost perspectives, however, the best site is near Fermilab; and everything should be done to promote such a solution. Fermilab has therefore launched an effort to develop in detail all of the information needed to support a bid to host the ILC here.

The physics of the ILC will be whatever the revolutionary new physics turns out to be. Whether it is supersymmetry, extra dimensions, or some other extension of the Standard Model of particle physics, the ILC will provide a completely new type of instrument to explore the new territory. Just as the cosmic microwave background and distant supernovae provide completely different measurements needed to understand the contributions of dark matter and dark energy to the energy budget of the universe, so the ILC will provide different insights from those provided by the LHC. They may also provide indirect evidence of new physics that might come from dark matter searches or decays of B mesons.

Wherever the ILC is built, the model will be quite different from earlier accelerator projects. Several laboratories around the world will build major components of the accelerator complex and the detector, in addition to making intellectual contributions to the design. As a result, the role of the host laboratory will not be as all-encompassing as it is for the LHC or the Tevatron. Of course, the ILC would be the largest effort at Fermilab, as it would be for the other laboratories. But Fermilab could not and should not abandon its other critical roles such as its host role for the US part of the CMS collaboration, which will still be very active and producing great physics in 2020.

The neutrino experiments that might be operating by 2015 include, besides MINOS, a shorter-baseline experiment at Japan's Proton Accelerator Research Complex (J-PARC), a possible second experiment using the Fermilab neutrino beam, and a possible experiment built at a reactor. Although we will know from these experiments far more about neutrinos, the least understood particles of any that we have yet seen, it is overwhelmingly likely that a more powerful experiment will be needed to explore the possibility of CP violation in neutrinos, the matter-antimatter asymmetry that could explain the survival of matter from the early universe until today.

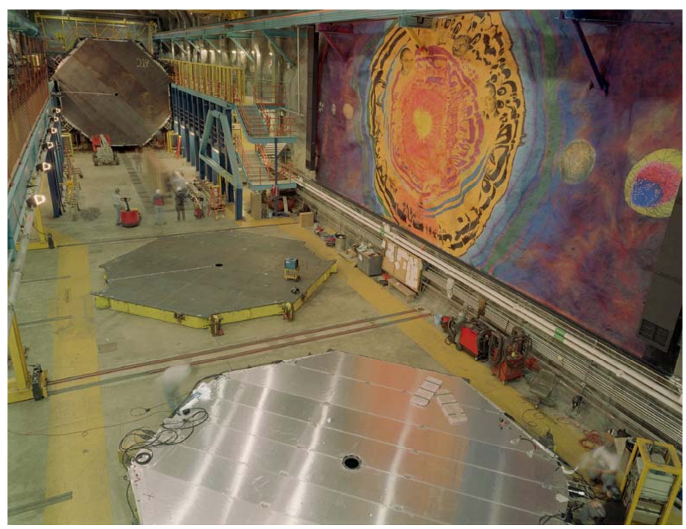


FIGURE 11 - A ½ -mile beneath the town of Soudan in northern Minnesota, the MINOS experiment is housed in the Soudan Underground Mine State Park; an artist's mural accompanies the 5,600-ton far MINOS detector.

To follow the path of neutrino discovery will take larger experiments and more intense neutrino beams than any being built today. The NuMI neutrino beam and the MINOS experiment started operating in February 2005. They will form the basis of a series of steps along the path of discovery, each one designed to take best advantage of what is learned earlier. The next step could be a larger experiment built off the axis of the NuMI beam line, coupled with some modest intensity upgrades to the accelerator complex.

The biggest step in the future of neutrinos at Fermilab would be a low-energy (8 GeV) but high-intensity Proton Driver, capable of producing 2 Megawatts of beam power at 8 GeV and, with the existing Main Injector, 2 Megawatts of beam power at 150 GeV. Such a project would be roughly as large as the Main Injector construction project. The technical design of the Proton Driver will be complete around 2007-8. If the ILC were not about to start construction at Fermilab by that time, the particle physics community would give a strong push toward building the Fermilab Proton Driver, ensuring a future for neutrino discovery physics that would last until 2020.

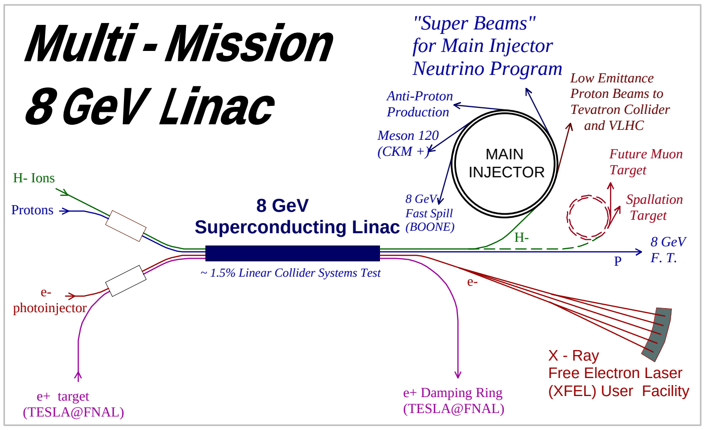


FIGURE 12 – The Fermilab Long-Range Planning Committee identified a very intense proton source, or Proton Driver, as one of the leading candidates for a future facility at Fermilab.

In summary, there are two alternatives for U.S. particle physics and for Fermilab in 2020. In the first, preferred scenario, Fermilab would be the host of an international ILC in northern Illinois, in which several laboratories around the world would be major stakeholders. Physics at the ILC would be the largest research activity at the laboratory. There would also be continuing research at Fermilab on particle astrophysics, LHC, and neutrino physics, following the evolution of those fields based on the discoveries of the previous decade.

In the second scenario, in which there is no ILC built in the U.S., Fermilab would develop its unique set of accelerators further, making it once again into the world's leading instrument for neutrino physics. A series of upgrades to the present accelerators and detectors would be needed, with the Proton Driver as the single largest step. Fermilab would continue its role in LHC physics and particle astrophysics. It would also have a role in the ILC somewhat similar to its present role in the LHC.

The overlap in R&D for a Proton Driver and the ILC benefits both projects. Each proposes to use high gradient superconducting cavities operating in pulsed mode to accelerate particles traveling near light speed. In particular, the proposed Superconducting Radiofrequency Development & Test Facility (SCRF) at Fermilab would serve both programs. The SCRF could also be used by other accelerator projects that require a test facility for superconducting accelerating structures. The SCRF would be the first phase of this effort followed by a production facility in subsequent years.

For the near future, Fermilab will pursue R&D toward the ILC and a Proton Driver in parallel. Fermilab is studying the physics opportunities created by a Proton Driver; and the detectors that the associated experiments would require. The immediate goal of Proton Driver activities is to produce documentation to support a determination of mission need Critical Decision 0 in the DOE project management system) and to move forward with Proton Driver R&D toward Critical Decision 1.

In either case, Fermilab would be the U.S. site for accelerators operating at the forefront of particle physics. The LHC and the ILC, would be international science enterprises, involving all of the major particle physics laboratories around the world.

The discoveries of the coming decade will significantly clarify the picture of U.S. particle physics twenty years from now. The physics program in 2020 and beyond will be shaped by all that we learn about the physics of the universe between now and 2010.

G. Currently the Fermilab staff is slightly greater than 2000 individuals, of whom approximately ten percent have scientist appointments. Perhaps two-thirds of the remaining employees are technical (engineers, computing professionals or technicians). The long-range plan for the laboratory envisages a vigorous maintenance of an accelerator-based elementary particle physics program and a growing astroparticle physics program. The most likely evolutionary path for the size of the laboratory staff is that it should maintain approximately its current size. The long-range plan pointed to the International Linear Collider built near Fermilab as a highly desirable possibility. In that situation, it will be important to differentiate between the two entities. Current models of governance envisage that the ILC would utilize a maximum of the host laboratory infrastructure. Nevertheless, there would be an influx of personnel, both employees and personnel seconded from other large laboratories contributing to the ILC. In this scenario, the total employed complement between the two entities could increase by 50%. On the other hand, it is likely that most of this expansion would take place in the out-years with respect to the current plan with a ten-year horizon. The on-site user community is dominated by the large numbers associated with the two collider experiments. From five years hence the activities associated with these collider experiments would begin to tail off; operations would cease but analysis would continue. Currently we are developing a Large Hadron Collider Physics Center, which would enable a smooth transition from the current era to that of the LHC. It is anticipated that Fermilab will be home to a substantial number of users who would find Fermilab to be an attractive base for participation in the CMS experiment. The neutrino program is also expected to develop more strength with a possible build up to an era of the Proton Driver. A relatively stable resident user community is more likely than either a dramatic reduction or a very rapid increase. Again, in the outyears, the impact of an incipient ILC program might drive an increase in the user population.

H. Effects on Facilities and Infrastructure.

The opportunities identified for Fermilab in 2010 and 2020 as well as the ongoing operations provide a roadmap for a path forward, and each opportunity may or may not advance depending on discoveries in the field of High Energy Physics. Figure 14 provides a tentative timeline by scientific activity for how Fermilab may advance over the next two decades. As one might expect, planning for Facilities and Infrastructure of both a programmatic and conventional nature in support of these dynamic opportunities will be a challenge from many aspects but a challenge for which Fermilab is actively preparing. This effort will include annual updates to coincide with the TYSP annual budget submission, with identification of both programmatic and conventional facility projects as part of the required resource projections.

There are several things Fermilab needs to do now to realize the opportunities for discovery in the next decade and to be ready to build the facilities needed for the discoveries in the decade after that. Some of these are already being done:

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1. Continue to push Run II physics to its limits over the next few years. Nothing could advance the field more than a first discovery of dramatically new physics at the energy frontier with CDF and DZero. There is a well-thought-out plan to optimize the physics from Run II, and a new round of exciting results will be coming out every year. As Run II TeVatron operations may wind down near the end of the decade, the impact on the associated infrastructure will be addressed.

2. Provide more protons for the neutrino program. Neutrino experiments can always make good use of more protons, and steps are being taken to increase proton intensity.

3. The limits of the present set of accelerators. The Accelerator Division is developing a plan for improvements in the next few years, and is also looking at major upgrades that could be done before the Proton Driver is ready for construction.

I. In other areas, the following recommendations of the Long-Range Planning Committee are appropriate as Fermilab works to build for the future.

1. Grow the research effort on the ILC, on both the accelerator and detector fronts, and do detailed studies of nearby sites. The ILC R&D team is developing plans to expand the effort at Fermilab. A site plan appropriate for a host laboratory is being developed. In addition, Fermilab is putting together a bid to host the central design team that will lead the technical design of the ILC.

   a. Most critical need: establish world-class expertise in SC RF technology in the US.

   b. Facilities at Fermilab: buildings exist, need to reinvest in infrastructure (power,cryo,RF) for cryomodule assembly and testing.

   c. Integrate this work into the global effort.

2. Advance the design of a Proton Driver and develop fully the physics case for it. The Director has appointed leaders of the Proton Driver effort and asked them to lead a team to accomplish these goals. The immediate goals are to develop and document the physics case, establish documentation of mission need, prepare cost estimates for the linac and synchrotron options, and to examine siting issues. Build up the CMS research program at Fermilab, including the LHC Physics Center. The Director has written a letter to the leaders of the CMS research effort committing the laboratory to building up the LHC Physics Center and asking them to get it started quickly.

3. Establish a Center for Particle Astrophysics at Fermilab. This center will serve as the intellectual center for research at the laboratory related to astrophysics. The various groups working in this area of physics will be located together.

For U.S. physicists to be at the forefront of the coming revolution in particle physics, Fermilab should lead the way and it is our plan to do so.

J. Mission Critical and Mission Dependent Facilities

The Federal Real Property Council's December 2004 "Guidance for Improved Asset Management," defines Mission Critical facilities as those assets without which the mission is compromised.

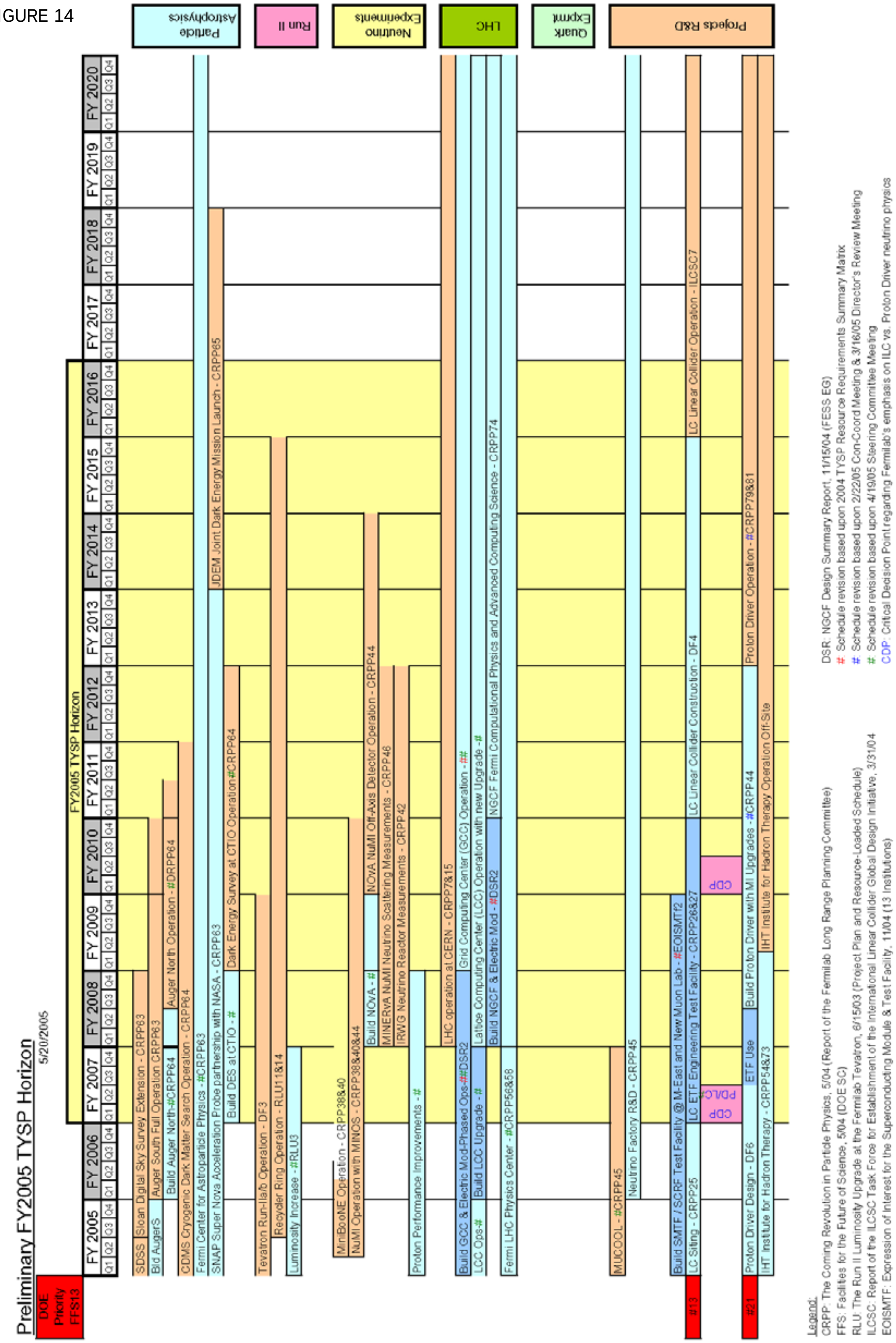
In keeping with this definition, Fermilab considers all support facilities required for timely response to accelerator and detector operations mission critical. Support facilities such as the Fuel Service Center provide mission support, but the mission can still be accomplished in their absence. These types of ancillary facilities, including most office space, are better described as mission dependent.

Most housing, recreation and storage facilities are not mission dependent. Each asset's mission dependency status will be noted in the FIMS data field.

Within these mission critical facilities, a building or system that has the potential to disrupt accelerator operations is assessed more frequently and holds a higher priority for funding. In this category are facilities housing programmatic equipment including the cryogenic service buildings, utility support facilities such as the Master Substation and Central Utility Building, as well as and utility systems supporting accelerator operations.

FIGURE 13 – The Central Utility Building, the blue facility in the foreground, houses the chilled water, hot water boilers, and domestic water treatment plant for the local buildings.

FIGURE 14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FY 2008
FY 2009
FY 2010
FY 2011
FY 2012
FY 2013
FY 2014
FY 2015
FY 2016
FY 2017
FY 2018
FY 2019
FY 2020
Particle Astrophysics
Run II
Neutrino Experiments
LHC
Quark Exprmt
Projects R&D
SDSS Sloan Digital Sky Survey Extension - CRPP63
Bld AugerS Auger South Full Operation CRPP63
Build Auger North-#CRPP64
Auger North Operation - #CRPP64
CDMS Cryogenic Dark Matter Search Operation - CRPP64
Fermi Center for Astroparticle Physics - #CRPP63
SNAP Super Nova Acceleration Probe partnership with NASA - CRPP63
JDEM Joint Dark Energy Mission Launch - CRPP65
Build DES at CTIO - #
Dark Energy Survey at CTIO Operation #CRPP64
Tevatron Run-IIa/b Operation - DF3
Recycler Ring Operation - RLU11&14
Luminosity Increase - #RLU3
MiniBooNE Operation - CRPP38&40
NuMI Operation with MINOS - CRPP38&40&44
Build NOvA - #
NOvA NuMI Off-Axis Detector Operation - CRPP44
MINERvA NuMI Neutrino Scattering Measurements - CRPP46
IRWG Neutrino Reactor Measurements - CRPP42
Proton Performance Improvements - #
LHC operation at CERN - CRPP7&15
Build GCC & Electric Mod-Phased Ops-#DSR2
Grid Computing Center (GCC) Operation - ##
LCC Ops-#
Build LCC Upgrade - #
Lattice Computing Center (LCC) Operation with new Upgrade - #
Build NGCF & Electric Mod - #DSR2
NGCF Fermi Computational Physics and Advanced Computing Science - CRPP74
Fermi LHC Physics Center - #CRPP56&58
MUCOOL - #CRPP45
Neutrino Factory R&D - CRPP45
Build SMTF / SCRF Test Facility @ M-East and New Muon Lab - #EOISMTF2
LC Siting - CRPP25
LC ETF Engineering Test Facility - CRPP26&27
CDP
PD/LC CDP
LC Linear Collider Construction - DF4
LC Linear Collider Operation - ILCSC7
#13
#21
Proton Driver Design - DF6
ETF Use
Build Proton Driver with MI Upgrades - #CRPP44
Proton Driver Operation - #CRPP79&81
IHT Institute for Hadron Therapy - CRPP54&73
IHT Institute for Hadron Therapy Operation Off-Site
Legend:
CRPP: The Coming Revolution in Particle Physics, 5/04 (Report of the Fermilab Long Range Planning Committee)
FFS: Facilities for the Future of Science, 5/04 (DOE SC)
RLU: The Run II Luminosity Upgrade at the Fermilab Tevatron, 6/15/03 (Project Plan and Resource-Loaded Schedule)
ILCSC: Report of the ILCSC Task Force for Establishment of the International Linear Collider Global Design Initiative, 3/31/04
EOISMTF: Expression of Interest for the Superconducting Module & Test Facility, 11/04 (13 Institutions)
DF: Discovery at Fermilab The Next Twenty Years, 5/25/04 (M. Witherell)
DSR: NGCF Design Summary Report, 11/15/04 (FESS EG)
#: Schedule revision based upon 2004 TYSP Resource Requirements Summary Matrix
#: Schedule revision based upon 2/22/05 Con-Coord Meeting & 3/16/05 Director's Review Meeting
#: Schedule revision based upon 4/19/05 Steering Committee Meeting
CDP: Critical Decision Point regarding Fermilab's emphasis on ILC vs. Proton Driver neutrino physics

Fermilab's Comprehensive Land Use Plan (CLUP) is based on DOE Policy 430.1, Land and Facility Use Planning, and was last updated in 2002. The CLUP includes Regional Conditions, Local Existing Site Conditions and a Planning Analysis.

Management of the industrially developed portions of the Fermilab site is the responsibility of the occupying organizations in compliance with Directors Policy statements. Fermilab's Environmental Management System assists management in decision-making by providing the structure for determining environmental hazards and necessary mitigating methods relevant to impacts that operations have on the surrounding environment. The Environmental Monitoring Program Plan documents the rationale for effluent monitoring and comprehensive environmental surveillance. The results of annual monitoring are available publicly in the Annual Environmental Report to the Director at http://www.fnal.gov/directorate/documents.html. The program monitors air, surface water, ground water, penetrating radiation, and ecological changes.

FIGURE 15 - Fermilab has more than 1200 acres of tallgrass prairie under restoration. One of Fermilab's landmark facilities, Wilson Hall, is in the background.

The agricultural or otherwise undeveloped portions of the site are managed in accordance with the Ecological Land Management (ELM) Plan. The laboratory's standing ELM committee provides technical assistance and development recommendations for the maintenance and restoration of available lands. The Fermilab 6800-acre parcel is divided into management tracts as shown in Figure 15 called the Fermilab Land Management map. The ELM Plan is updated annually and is meant to be dynamic with changes based on management needs and ecological considerations.

The laboratory policy for land use proposals considers multiple factors in evaluating any land use proposal. Factors include:

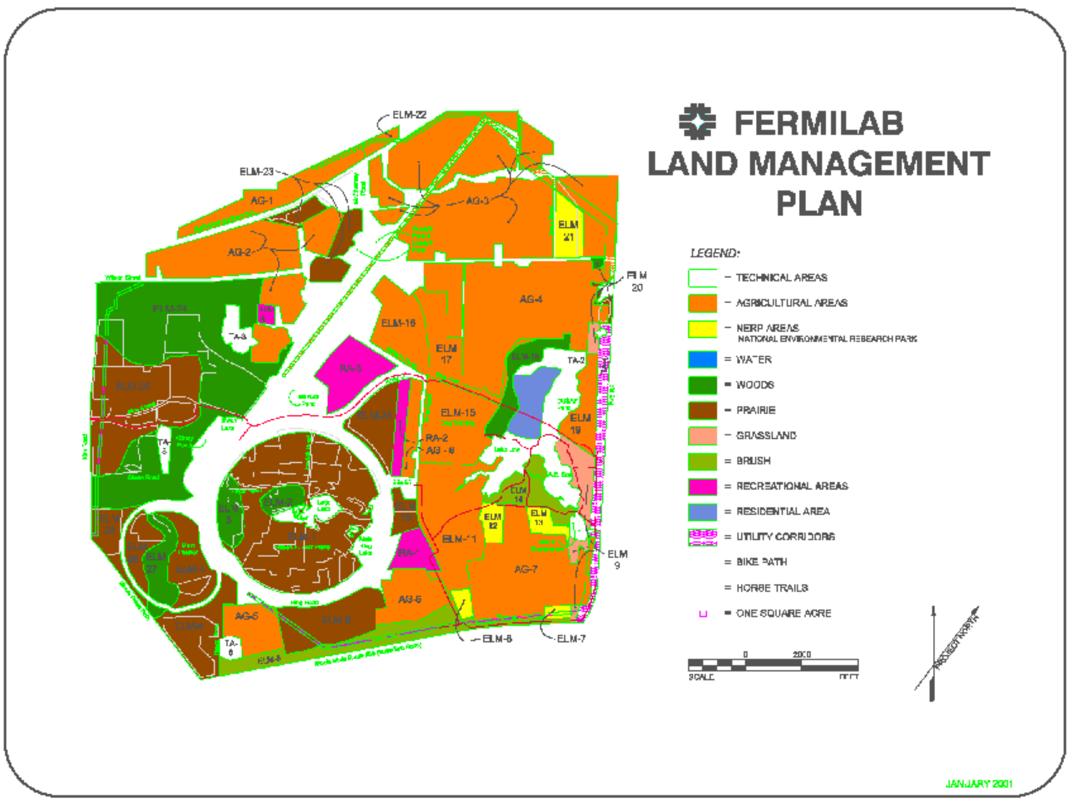
1. Effect on mission
2. Any irreversible change to the site
3. Effect to Fermilab's future
4. Impact to all stakeholders
5. Effect to non scientific areas
6. Effect on health and safety
7. Effect on security
8. Effect on neighboring communities
9. Impact to site aesthetics

The area surrounding Fermilab is developing rapidly. In addition to routine land management issues requiring necessary coordination of storm water management associated with neighboring development and requests for utility easements, Fermilab monitors regional transportation issues including road and rail construction activities.

DuPage County's proposal to extend the north/south road along Fermilab's eastern boundary dates back to 1998. The DOE and Fermilab position has always been that a road or any facility proposed for the Fermilab site must not compromise Fermilab's ability to carry out its mission as a particle accelerator lab.

Ongoing planning activities for the lab's existing mission and future mission opportunities will continue to be consistent with the CLUP and the ELM recommendations, and land use proposal guidelines.

FIGURE 16 – ELM Map



OVERVIEW

In its real property inventory, Fermilab's 351 buildings total 2.3 million gross square feet and its 29 other structures and facilities (OSFs) include miles of utility systems on 6800 acres. The detailed property information and capitalized value detail associated with each of these assets is maintained in the United States Department of Energy's Facilities Information Management System real property database (Section 4, Part 12).

In a September 9, 2004, memo, "Maintenance Investment and Replacement Plant Value" the Office of Science (SC) and Office of Engineering and Construction Management (OECM) baselined Fermilab's infrastructure Replacement Plant Value (RPV) at $518M. RPV is defined as the cost to replace a facility for the current use using current building methods & codes. The SC/OECM baseline excludes Fermilab's programmatic tunnel structure ($746 million) and site prep asset ($6 million). This site's total current RPV is $1.3 billion, including the programmatic accelerator. The accelerator's $746 million is not considered conventional real property since it is not easily reusable and very little conventional maintenance is required. The remaining RPV is split among buildings at $418 million and other structures and facilities (OSFs) at $142 million. These RPV figures differ from the SC/OECM baseline due to OSF and building recalculations as part of an internal quality assurance review and resulted in the increased RPV figures shown below. Fermilab will continue to notify the Office of Science regarding additional RPV changes beyond 5% in any asset category (buildings, OSFs or Programmatic OSFs), as outlined in the SC memo.

The current Replacement Plant Value is summarized below:

Infrastructure	**Replacement value ($M)**
Buildings	418
Utilities (OSFs)	142
OSF 3000 (programmatic)	746
TOTAL	1,305

(FIMS data, 05/16/05)

As the administrative center of the Fermilab campus and comprising 22% of the building RPV is Wilson Hall. This 16-story office building is nearly 25% of the total Fermilab gross square footage and 80% of the site's office space. Nearly 20% of the remaining square footage – about 1/3 of all Fermilab buildings – is accelerator service buildings, with grade level access and mechanical support along the length of the accelerator chain.

As Figure 5 presented in the Site Summary, the age of Fermilab's buildings varies widely. Of the total Fermilab square footage, 36% represents buildings more than 30 years old, with 4% over 100 years old (17 buildings). The buildings less than 30 years old were constructed specifically for laboratory operations in the early 1970s, while the buildings older than 35 years were part of the original land acquisition for the site and included a residential village complete with utility systems. These older facilities present different operational and maintenance challenges in comparison to the buildings less than 30 years old (142 buildings or 41% of total number of buildings). Generally, these newer buildings fare well when the ratio of deferred maintenance to

Facility Condition Index (Deferred Maint/Replacement Value)	
Excellent	<2%
Good	2%< 5%
Adequate	5%< 10%
Fair	10%< 25%
Poor	25%< 60%
Fail	>60%

RPV, or the Facility Condition Index (FCI), is considered. In FY04, the site building FCI was 1.7%, with 70% of buildings scoring as Excellent. When measured by gross square footage, rather than number of buildings, 77% of the facilities rate Excellent (<2% FCI).

A single Fermilab building, a small storage shed (#261) with a failed roof, carries a FCI greater than 60% and will be demolished in FY05. Twelve facilities have an FCI between 25% and 59%, defined as Poor. As none of these buildings are mission critical and the deficiencies are not impacting the function of these assets, no plans are underway to move these facilities to an improved FCI category. One of these poor facilities (#951) is scheduled to be demolished in FY05 and another (#150) would be demolished as part of TD's Advanced Materials Laboratory consolidation.

The existing building facilities are meeting the current operational and experimental needs of the site. Specific facility reuse and consolidation plans related to mission needs are discussed in Part 6, Facilities Supporting Mission Activities. In these instances, laboratory management is working to identify and satisfy facility needs through re-assignment and modernization. However, as future mission opportunities continue to develop, additional experimental facilities will likely be needed.

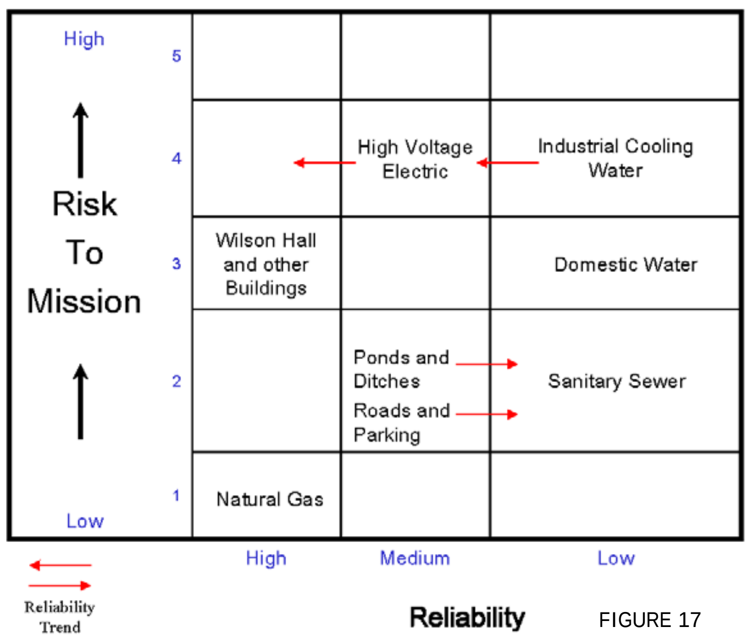


FIGURE 17

Similarly, the lab's utility infrastructure may require expansion as future mission is identified. The lab's utility infrastructure is currently in need of investment and substantial GPP efforts identified in this Plan will improve the reliability of the lab's most critical utility systems as shown by the trend arrows in Figure 17. The Facilities Engineering Services Section (FESS) works closely with experimental planning groups to plan future project siting near existing utilities or easily expanded facilities. Section 4, Part 6 includes details of Fermilab's utility systems, including condition, deferred maintenance, and investment plans and maps. As an overview, the utility systems include the following assets:

- Electric – 345kV power is received from utility grid at two primary substations, 280 secondary substations, 110 miles of cable (80 miles underground)
- Natural Gas – 14 miles of underground piping
- Cooling Pond Water – 140 acres of ponds with return and supply channels
- Industrial cooling water – 21 miles of piping
- Sanitary System – 12 miles of sewer collection piping and lift stations
- Domestic water – 4 wells, treatment and distribution piping

PART 1 FACILITIES & INFRASTRUCTURE GOALS

The success of any program is dependent on the clarity of the vision. For achievement of the lab's ongoing mission and proactive transition to future opportunities, the following vision, objectives and goals have been established:

Vision Statement:

To *plan for, establish,* and *maintain* a *dependable base* from which Particle Physics and other FNAL programs can be *safely* accomplished *without interruption*.

A. Objectives:

- *Provide leadership* - Recruit and retain a high level of expertise for real property management with responsibility to:

  Investigate, analyze, prioritize and execute infrastructure requirements necessary to satisfy the mission in the "best" possible manner, including sustainable design, equipment standardization, and effective operations and maintenance.

  Assess and strengthen infrastructure planning and data collection.

- *Avoid unscheduled downtime* - the operating platform used to successfully conduct High Energy Physics (HEP) missions including the facilities, utilities, and other general services shall be operated and maintained at the highest levels to avoid unscheduled downtime.

- *Achieve and maintain an ES&H conscious environment* – create a workplace that eliminates the potential for threat or harm to human, material, and environmental resources.

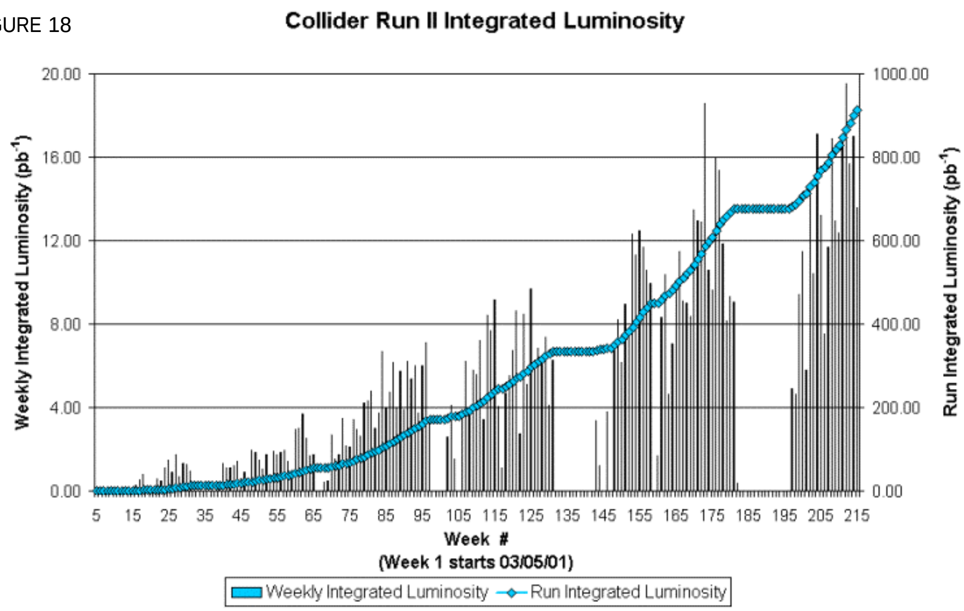
- *Establish and Improve infrastructure to the identified standards* – get all infrastructure to the desired point of operational effectiveness and modernization consistent with established criteria and guidelines.

- *Operate and Maintain infrastructure for peak performance and sustainability* – is the function of upkeep, preservation and repair ideally once a maintainable state has been achieved that succeeds in the establishment of a new or improved system in order to obtain the best operating efficiencies at the least total cost of ownership over the life of a particular system.

B. Goals

1. Luminosity is the number of particle collisions from which scientific data is collected, analyzed and discoveries made. The lab's most significant goal is increased integrated luminosity. Among other elements, luminosity is a function of facility condition, successful management of infrastructure related items, and utility reliability/capacity. Figure 19 shows the increased luminosity over the past three and a half years that exceeded all Lab goals.

FIGURE 18



2. Reduction of unscheduled accelerator and detector downtime due to utility infrastructure failures specific to increased integrated luminosity impact will be mitigated.

3. Elimination of safety-related accidents that result in any injury or damage to property or the environment.

4. Conduct condition assessments per DOE order 430.1B, at least once every five years on buildings and utility systems, and more frequently on selected facilities.

5. Maintenance investments in real property assets at levels recommended by the Office of Science.

6. Management of real property asset deferred maintenance growth is controlled at an acceptable level.

7. Periodic external reviews of laboratory administrative areas, including real property management, will be conducted.

8. Stewardship of real property assets: Compliance with all policies involving real property asset management including maintenance, investment levels and space management.

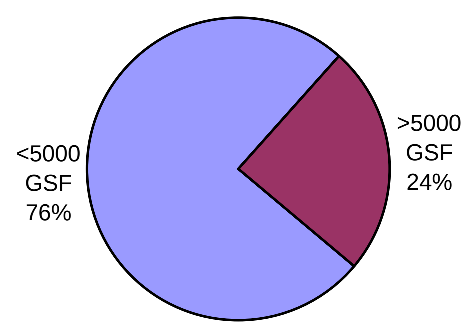
PART 2 **CONDITION ASSESSMENT PROCESS**

Condition assessment is a perpetual process for Fermilab facilities and infrastructure, tailored to status, mission, and importance, and the magnitude of the hazards associated with each asset. The process combines five-year site-specific inspections, Whitestone Research's Building Maintenance and Repair Cost Forecast System, and data provided to landlord Divisions/Sections (generally building managers) by other specialists.

The Whitestone MARS analysis provides life cycle projections for major repairs and end of life replacements for facility components. The projections are adjusted based upon standardized, documented inspections performed by FESS on each facility every five years. Subsequently, the inspection team and the facility manager meet and develop a five-year plan. Maintenance and repair needs are prioritized using the inspection team's projections of serviceability, Whitestone's economic life schedules, and the facilities' mission and funding availability for deferred maintenance reduction. Cost estimates utilize Whitestone's locally adapted data based on R.S. Means costs, as well as adjustments from the FESS Engineering group based on recent experience for the local market. The five-year plan provides justification for and supports lab-wide zero-based budgeting. Use of the same process across the entire campus helps assure reasonable and consistent distribution of maintenance resources between groups and across the various funding programs (operating, GPP, and line item).

During the interim years between inspections, building managers receive regular input on major architectural, mechanical, and electrical components such as roofs, HVAC, fire detection and protection, and electrical equipment from FESS' craft or engineering specialists. Facility safety and health hazards are identified and reported as a result of regular inspections by the site fire department, emergency services, senior site fire protection engineer, industrial hygiene and other specialists. The respective building managers also perform regular inspections of their facility. The Whitestone analysis is updated annually, utilizing feedback from the building manager and the other specialists. The annual update provides deficiency/backlog listings and a new five-year plan, with updated repair and replacement values based on standardized cost data.

FIGURE 19 - Building Size Distribution



Higher priority facilities and utility systems receive more frequent condition assessments than the required five-year cycle. Buildings included in this category are high voltage substations, the Central Utility Building and pump houses.

As an RPAM performance measure, Asset Condition Index (ACI) is DOE's measure of facility condition, which reflects the outcome of real property maintenance and recapitalization policy, planning and resource decisions.

ACI is determined by the formula 1 – FCI, where FCI equals deferred maintenance divided by Replacement Plant Value. The resulting ratings are based on the comprehensive condition assessment surveys of the facilities.

The RPAM ranges and ratings are:

Excellent = 1.0 > 0.98
Good = 0.98 > 0.95
Adequate = 0.95 > 0.90
Fair = 0.90 > 0.75
Poor = 0.75 > 0.40
Fail = < 0.40

Fermilab's FY04 Building ACI was calculated at 0.983*, or Excellent*. The vast majority of Fermilab facilities are smaller than 5000 GSF each (Figure 21). Many of these facilities are similarly designed, allowing for efficient and effective preventive and corrective maintenance.

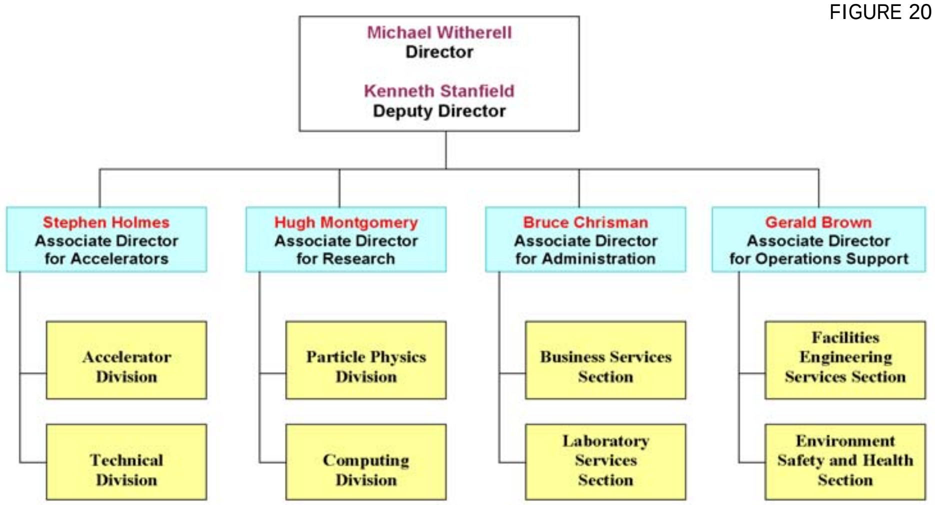
For utilities, the FY04 ACI equaled 0.72. While this ACI for utility systems ranks as Poor, Fermilab is performing a thorough assessment of deferred maintenance and replacement plant values for all Other Structures and Facilities (OSFs) that is expected to validate the OSF ACI. Additional information about Fermilab's management of deferred maintenance is discussed in Section IV, Part 12.

PART 3 **FACILITIES MANAGEMENT RESPONSIBILITY**

Facilities management responsibility at Fermilab is outlined in various policies within the Fermilab Director's Policy Manual. Every facility at Fermilab is assigned by the director to the head of one of the eight divisions or sections or to the directorate within the lab organization shown in Figure 20. Divisions are responsible for accomplishment of the programmatic mission while sections provide common support functions to the divisions. The Facilities Engineering Services Section (FESS) has responsibility for all utility systems and the Accelerator Division has responsibility for the accelerator complex.

Fermilab Directorate Organization Chart

FIGURE 20



The division or section head (landlord) is responsible for the success of the programs carried out in the facilities under their direction which includes responsibility for funding requests and implementation of the various phases from acquisition through demolition or reuse that are included in a facility life cycle. Landlords assign a building manager for each building under their responsibility. Each building manager reports to a division or section facility manager. For consistency between landlords, the Fermilab ES&H Manual (FESHM) chapter 2050 prescribes the requirements for the building manager.

Director's Policy No. 5 covers all maintenance activities at the laboratory specific to Facilities and Utilities, Accelerators and Beamlines, and Detectors with four general goals for the maintenance program. The goals include:

1. Facilities and equipment are maintained in an operating and safe condition.
2. Maintenance operations are completed in a safe, deliberate and efficient manner.
3. Maintenance activities are carried out with minimal impact on facility or equipment availability.
4. Systems are maintained with the objective of achieving high reliability within an established budget.

Director's Policy No. 18 governs Construction and Modification activities at Fermilab and assigns oversight responsibility for certain aspects of each project to the Facilities Engineering Services Section and Directorate. While landlords have responsibility for real property maintenance and operations for each facility assigned to them, Directors Policy No.18 ensures that any construction activity is planned, designed and completed using professional architectural and engineering standards. The Associate Director for Operations Support reviews and approves all building construction and modifications for building and safety code compliance. The director or his deputy reviews building modifications for aesthetic considerations.

Another important aspect of landlord responsibility is utilization of assigned assets to fulfill mission responsibilities. Director's Policy No. 36 describes the Facility Reuse Program. If the mission or particular program at the lab changes such that more or less assets are needed, the landlord is required to notify the Fermilab Capital Asset Manager to start acquisition planning, facility reuse or disposition activities. Ongoing utilization assessments are completed to assess the need for increased or a reduction in facilities to fulfill a landlord mission. Based on these assessments, most existing facilities are currently considered fully utilized and needed to support the Fermilab mission even though some utilization may be periodic and irregular, based on experimental activities. Consistent with the criteria established in the OECM memo of 28 July 2004, the site's Asset Utilization Index is 1.0. Those assets which previously hadn't been utilization justified have had disposition actions initiated or completed under the Office of Science Excess Facilities Disposition Program. Since Fermilab is a single program lab and funded from one primary program source, space charges have not been necessary to achieve the most efficient operation. The annual budget process, which requires each division and section (landlord) to present landlord requirements to the directorate (under a peer review format) helps identify facility needs and determines the most efficient utilization of available resources.

Fermilab utilizes a decentralized facility management approach, in which each division and section has responsibility for its assigned facilities. By placing the responsibility for identifying, presenting and defending all real property resource needs at the landlord level, which best understands these requirements as a function of their scientific operations, this decentralized approach is effective. In addition to the Director's Policies described herein that ensure consistency across landlord operations, the Facilities Engineering Services Section (FESS) supports each landlord with professional planning, engineering, acquisition, construction management, operations, maintenance and other real property support functions. FESS also has lab wide responsibility for administration and management of the DOE Facility Information Management System (FIMS) and as such provides oversight of all real property activities and acts as an aggregator for all real property management actions, including FIMS reporting.

The infrastructure condition assessment administrator and real property administrator are FESS staff members coordinating daily with landlord staffs on multiple real property management issues. FESS also works directly with the laboratory budget office to prepare data for the annual maintenance plans and quarterly reporting on the maintenance budget.

The favorable site and building ACIs demonstrate that this decentralized approach has been effective. The results of this approach are summarized in a statement from the October 2003 peer review, "All buildings that were examined seem to be well cared for. In particular, the work spaces were of a quality that equals the best most of us have observed in the DOE community."

PART 4 **FACILITIES SUPPORTING MISSION ACTIVITIES**

Overview

Part 4 reviews all Fermilab assets, as divided into their landlord organizations. The previous section included a summary of the operations policies that govern the management of buildings by division and section. Figure 21 shows building assets and real property indicators by Division & Section (D/S). As was previously discussed in Section IV, Part 4, Facility Condition Indices (FCI) less than 2% validate successful management of facilities by each Division and Section. With respect to utilization, the site Asset Utilization Index (AUI) is currently 1.00, consistent with the OECM guidance of 28 July 2004. Detailed utilization and building information for each division and section is presented in the balance of Part 6, including a summary of existing and future facility needs. The site map (Figure 22) on the following page presents an overview of building locations.

This part of the TYSP presents facilities and infrastructure information organized by division and section (landlord) with regard to mission, condition, utilization and other facility issues. It is in this area where future updates will specifically identify necessary resources to fulfill the future mission requirements discussed in the document. Further, it is expected that the identification of the four Fermilab sections' requirements will lag behind the four divisions since the programmatic requirements will drive the support requirements provided by the sections.

FIGURE 21

Division/Section	Current RPV	FY04 DM	FY04 RIC	FY04 FCI	GSF	#bldgs
Accelerator Division	$117M	$2,561k	$0k	2.27%	540k	121
Technical Division	$33M	$906k	$4,250k	2.78%	218k	27
Computing Division	$16M	$329k	$13,826k	2.02%	93k	2
Particle Phys Division	$99M	$1,253k	$1,029k	1.19%	434k	61
Env Safety & Health Section	$6M	$14k	$3,500k	2.38%	35k	12
Lab Services Section	$13M	$201k	$0k	1.50%	210k	86
Business Services Section	$5M	$200k	$0k	3.98%	94k	7
Facilities Eng Serv Section	$129M	$1,636k	$4,217k	1.27%	679k	34
Directorate	$0.13M	$.8k	$0k	0.64%	1k	1

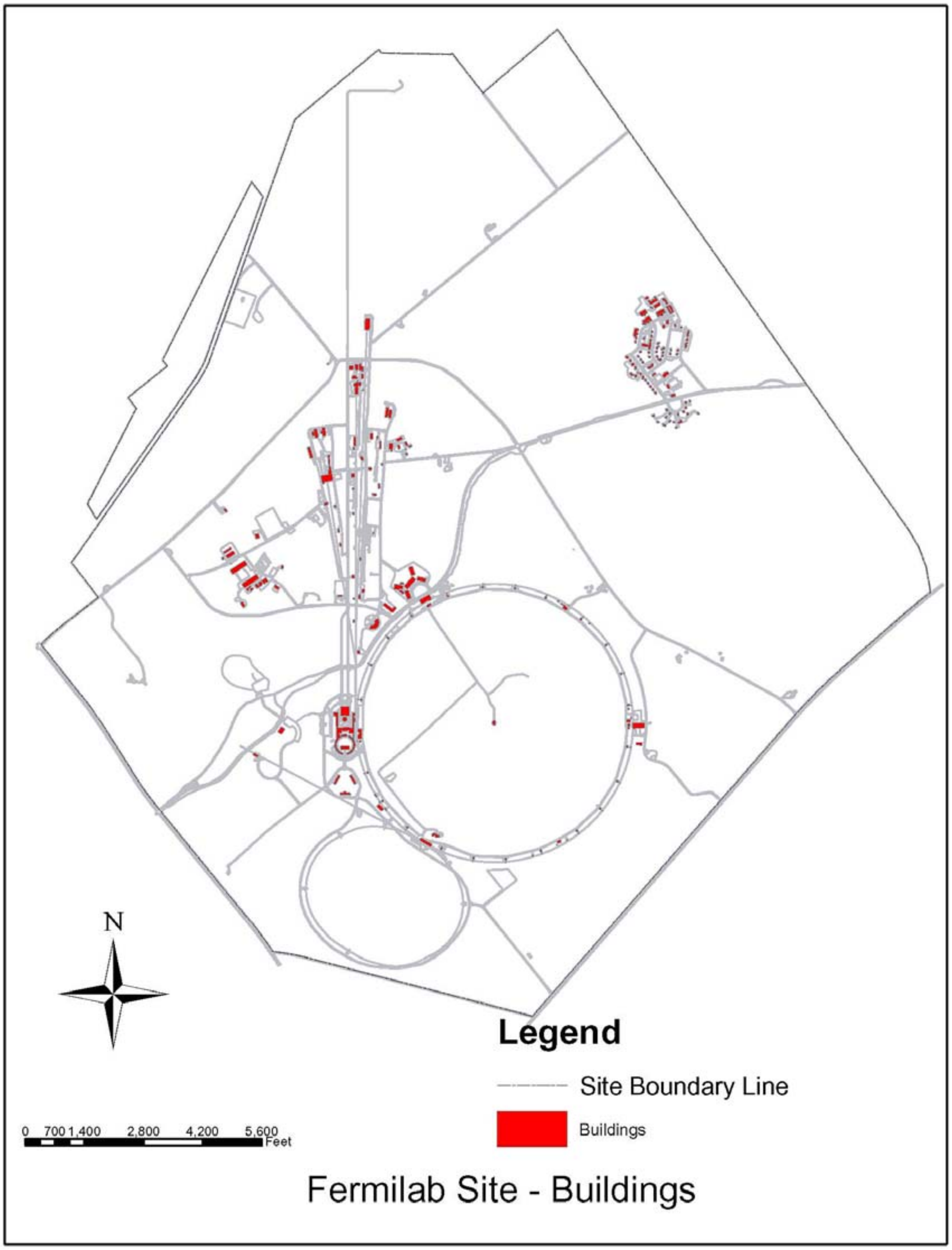


FIGURE 22 – Fermilab Building location overview

A. Accelerator Division

1. The mission of the Accelerator Division includes:

- Providing the expertise to reliably and cost effectively deliver particle beams to qualified researchers conducting basic research at the frontiers of high-energy physics and related disciplines.

- Operation, maintenance and improvement of the existing Fermilab accelerator complex and beam lines.

- Particle beam physics research.

- Development, design and building of the accelerators and subsystems required to advance the field.

2. Facility assignments

Of the 121 Accelerator Division (AD) buildings, 82% are accelerator service buildings that provide grade level access to the accelerator tunnel, and house programmatic equipment. The remaining AD buildings consist of storage, lab and office space. The RPV of AD's 540,000 gross square feet is $117 million.

FIGURE 23 – Fermilab plans to improve luminosity with the installation of the Recycler Electron Cooling experiment.

3. Facility Condition Index

The FY04 ratio of deferred maintenance to replacement value for Accelerator Division facilities is good, or 2.27%.

4. Facility issues

Development of office and technician work space has not kept pace with the evolving mission and associated personnel assignments. Planning efforts have been initiated for additional workspace in a new facility adjacent to the existing accelerator complex. The average age of AD buildings is 26 years, based on weighted GSF.

5. Utilization

Though the accelerator service buildings are generally not occupied, they are fully serving their usage function. The balance of AD facilities are occupied and fully utilized.

6. Planned maintenance & recapitalization projects

The largest portion of Accelerator Division deferred maintenance includes deficiencies in building comfort HVAC and chilled water systems.

B. Technical Division

1. The mission of the Technical Division includes:

- Responsibility for the development, design, fabrication or procurement, and testing of accelerator and detector components.
- Provision of labor, expertise, and facilities for a variety of activities related to this mission.

2. Facility assignments

The 27 Technical Division (TD) buildings consist largely of shops, process and assembly space, and administrative space. These total nearly a quarter of a million gross square feet with an RPV of $33 million.

3. Facility Condition Index

The FY04 ratio of deferred maintenance to replacement value for Technical Division facilities is good, or 2.78%, the higher FCI is attributable to the older facilities that house TD shop functions in the Fermilab Village that have higher deferred maintenance than the more modern buildings.

FIGURE 24 – Many of the Technical Division functions are housed in the Industrial Area complex.

4. Facility Issues

The average age of Technical Division buildings is 29 years, based on weighted GSF. A fair amount of the machine shop space is housed in original acquisition buildings in the Fermilab Village.

5. Utilization

Technical Division's facilities are 100% utilized.

6. Planned maintenance & recapitalization projects

Technical Division's Master Planning effort for the Industrial Area would consolidate remote operations from the Fermilab Village & Wilson Hall into the area of the Industrial Center complex and result in significantly improved operational efficiencies. Expansion of the Industrial Center Area would be offset by demolition of the village facilities currently housing these operations.

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C. Computing Division

1. The Computing Division's mission is to play a full part in the mission of the laboratory and in particular to proudly develop, innovate, and support excellent and forefront computing solutions and services, recognizing the essential role of cooperation and respect in all interactions.

2. Facility assignments

Until FY02, Computing Division managed a single facility, Feynman Computing Center (FCC), that housed most of its computing capacity. Other data centers in Wilson Hall served specific functions including dedicated servers and fiber switching equipment. In FY02, a computing facility was established in Muon Laboratory to investigate the potential of operating a data center utilizing equipment and procedures designed for remote non-attended computing operations. This effort in PPD's Muon Laboratory (#700; Figure 25) proved to be a success and continues to be a test bed for unattended operations today. Infrastructure improvements are underway to reconfigure additional space in the Muon Laboratory to expand Lattice QCD Computing.


FIGURE 25 - Computing Division is utilizing space in the PPD-owned Muon Lab to increase its computing capacity.

In 2003, it became apparent that the expanding computing requirements driven by the successful data-taking of the CDF and Dzero collider experiments as well as preparing for support of the Large Hadron Collider would substantially exceed the electrical and cooling infrastructure at existing Computing Division Facilities. In order to satisfy these urgent needs, Fermilab coordinated a facility reuse effort. In July 2003, the Wide Band Service Building (#628) was identified as the primary candidate for an adaptive reuse conversion. This facility is located on the Proton beamline in the fixed target area of the site, approximately one-mile north of FCC. This project, currently under construction, is called Grid Computing Center (GCC), previously referred to as High Density Computing Facility and is intended to facilitate the development and deployment of grid technology for high energy physics research involving collaborations of scientific and computer professionals from a number of participating labs, universities and other organizations throughout the U.S., Europe and Asia

The RPV of Computing Division facilities is $16 million.

3. Facility Condition Index

In FY04, Computing Division had an FCI of 2.02%. Recent reviews of the precast structural system at the FCC have indicated water penetration and spalling concrete. As a result of the modernization reuse project at HDCF, its deferred maintenance deficiencies, including roof work, will be mitigated.

4. Facility Issues

As indicated above, Computing Division's buildings are relatively new. Though CD has outgrown the capacity of its Feynman Computing Center (#003), constructed in 1988, the building still meets the functional needs for personnel and equipment. As the CPU intensive computing operations move to more capable facilities, the FCC usage is expected to shift to disk farms supported by robotic tape silos. Consideration is being given to moving some equipment logistics functions to create office space in support of the remote facilities.

5. Utilization

Prior to its reuse conversion, the Wide Band building was managed by the Particle Physics Division. Built in 1985, Wide Band served experimental requirements for the Tevatron fixed target program and provided space for counting rooms, power supplies and support equipment. More recently, the facility was used for storage and supplemental space for the Electron Cooling experiment, housed in the adjacent Wide Band high bay facility (#626). This experiment was relocated to the Main Injector during the 2004 accelerator shutdown.

The Muon Lab, where CD is also expanding its computing capacity, most recently housed technician work space, which was consolidated.

6. Planned maintenance & recapitalization projects

Computing Division plans to address the issue of water penetration and spalling concrete at the FCC.

At the Grid Computing Center, Computing Division has a number of projects in process. These projects will utilize banked square footage from Fermilab demolitions accomplished in FY 2003, 2004 and 2005. The GCC Tape Robot Room will renovate an existing computer room in GCC to provide the infrastructure for robotic tape storage. This project will allow the storage of the physics data in two (2) locations on the Fermi site to mitigate the potential catastrophic loss of the entire data set. The GCC Computer Room Upgrades project will construct an addition to the south end of the building to house a computer room, support facilities and electrical service improvements. The GCC Computer Room C Conversion project will expand the capacity of the GCC by converting existing space in GCC tosupport high density computing. The GCC Computer Room D Conversion project will also expand the capacity of the GCC by converting existing space in GCC to support high density computing needs.

Fermilab operates large clusters of computers for lattice quantum chromodynamics, as part of the national computational infrastructure for lattice QCD established by the Department of Energy. Their goal is the understanding of the strong dynamics of quarks and gluons. As part of this initiative, the Muon Lab Room 107 Upgrades project will increase the electrical and cooling infrastructure at LCC in order to meet the anticipated computing requirements for FY06 and FY07.

The Computing Division is also developing plans for a future construction of a 40,000 square foot data center, referred to as the Next Generation Computing Facility. This project will utilize the existing Wide Band High Bay (FIMS #628) as part of an adaptive re-use program to provide the space for the construction of 6,900 square feet of high density data centers to support ongoing physics driven requirements. Extension of medium voltage electrical feeders from the Master Substation as well as the transformation of the power at the project site would also be included. The existing high bay building work will include the installation of a floor system to increase the available square footage and more efficiently utilize the space.

D. Particle Physics Division

1. The mission of the Particle Physics Division includes:

- Support of experimental and theoretical research in particle physics and the development of new research techniques; provides management and technical resources for the construction and operation of particle physics experiments, and promotes the exchange and communication of new results.

- Assist the Accelerator Division with technical resources for accelerator projects and in accelerator shutdowns

2. Facility assignments

The existing Lab A - Lab G complex was constructed in the mid-1970's as a research area for fixed target neutrino experiments. Associated modest support functions, including machine shops, technical shops and offices were included from the beginning. After the original experiments in the facilities were concluded, additional rounds of experiments were done with the Tevatron fixed target beams. As the Tevatron Fixed Target program wound to a close in 1997-1999, Fermilab management recognized the need for a master plan that set the long-term vision of the area. In 1998, this master plan, termed the Fermi Technology Campus (Figure 26), identified and documented this vision. The plan provides for a systematic conversion and adaptive re-use of the existing buildings and infrastructure to support physics research. Since detector improvements in the field of high-energy physics are constantly changing, each new and renovated space is being designed for maximum flexibility in order to accommodate new as-yet-unknown uses.

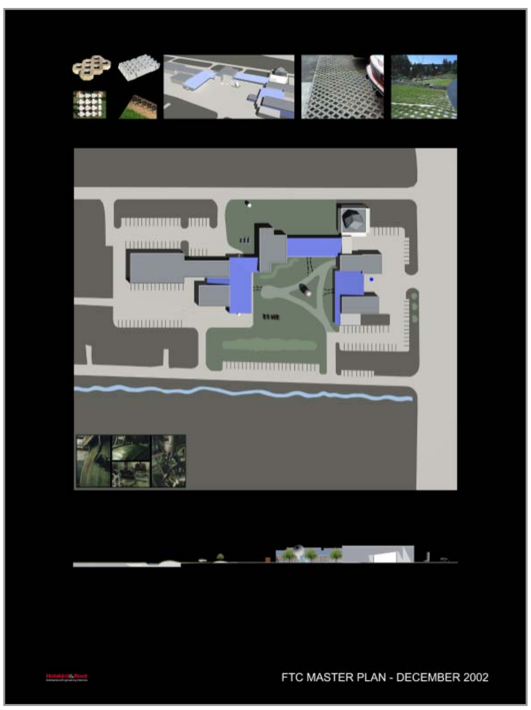

Figure 26 – PPD Master Planning

It was recognized early in the developmental stages of the plan that the implementation would be funding driven and driven by real programmatic needs. In other words, the "master plan" was to serve as a guide for development of the area. Several projects (Lab C-D Connection, Lab A-B Connection, Lab B-E-G Connection, Fixed Target Campus North Entry and parking revisions) have constructed in accordance with the master plan to meet the Particle Physics Division's need for space associated with a Silicon

Detector area. This plan allows technically related departments and groups within the Particle Physics Division to work within close proximity to one another at this location.

3. Facility Condition Index

The FY04 ratio of deferred maintenance to replacement value for PPD facilities is excellent, or 1.19%

4. Facility Issues

The average age of PPD buildings is 25 years, based on weighted GSF.

5. Utilization:

PPD facilities are currently 100% utilization justified. As part of a master planning effort (Figure 26), a lab/office campus at the north end of the neutrino line of the Fixed Target Area has been developed. Several buildings have recently been re-assigned or re-configured for more efficient space use.

6. Planned maintenance & recapitalization projects

The final component of the PPD Master Planning, the FTC North Entry, was completed in early 2005. The WH11 Office Mods project reconfigures office space on the 11th floor of Wilson Hall to provide space for the CMS department, including permanent offices, visitor's offices, meeting rooms as well as general gathering spaces. Renovated space on WH 6W will provide permanent offices, visitor's offices, meeting rooms as well as general gathering spaces for several PPD groups including CDMS, Pierre Auger, and the Theoretical Astrophysics group. Finally, the Theoretical Physics group of the Particle Physics Division (PPD/TP) and the Information Resources group of the Lab Services Section (LLSS/IR) will utilize newly reconfigured portions of the 3rd floor of Wilson Hall.

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E. ES&H Section

1. Mission

The mission of the ES&H Section is to ensure that research at Fermilab is conducted safely and responsibly. Responsibly means maintaining the well-being of Fermilab personnel and users, members of the public, property and the environment. It also means optimizing the resources available for this purpose by establishing, coordinating and maintaining quality programs in key areas and by providing competent administrative, technical and programmatic support for them. Key areas include radiation protection, industrial hygiene, environmental protection, general safety, emergency planning and response, safety training and health surveillance.

2. Facility assignments

Forty percent of ES&H's 34,000 GSF is process facility space. With a total of 12 buildings, ES&H also manages the fire station, equipment calibration, guard house, storage and office space. These buildings comprise $5.7 million in RPV.

3. Facility Condition Index

The FY04 ratio of deferred maintenance to replacement value for ES&H facilities is excellent, or 0.24%

4. Facility Issues

Based on weighted GSF, the average age of ES&H buildings is 26 years.

FIGURE 27 – ES&H provides assistance during all phases of facility life cycle, including proper disposal of demolished facilities' materials.

5. Utilization

ES&H facilities are 100% utilized. A number of ES&H facilities are used to manage low-level waste. As such, these are not occupied and usage is intermittent.

6. Planned maintenance & recapitalization projects

ES&H hopes to consolidate its fire and security operations in a single facility, either through an addition, reuse of another site facility or a new facility. Co-locating these functions would have the benefit of shared administrative functions and improved communication between these organizations. Favorable factors to determine the actual approach include facility size, parking availability, reuse adaptability ease and cost, access to infrastructure, severe weather resistance and a geographically central location.

F. Laboratory Services Section

1. Mission

The Laboratory Services Section (LSS) provides vital services to Laboratory employees and users in support of Fermilab's high-energy physics research mission, improves the nation's science education through teacher, student and public programs, and serves the scientific community worldwide through publications and visual images.

2. Facility Assignments

With a total RPV of $13 million, Laboratory Services manages all housing for visiting scientific users. As such, nearly 60% of its 210,000 GSF is user space, including housing, laundry, and recreation. The remaining space is used for storage, conferences and office.

3. Facility Condition Index

The FY04 ratio of deferred maintenance to replacement value for Lab Services 86 facilities is excellent, or 1.50%. LSS is proactive in managing the deferred maintenance for these facilities.

4. Facility Issues

The average age of Lab Services buildings is 62 years, based on weighted GSF.

5. Utilization

LSS facilities are 100% utilized.

6. Planned maintenance & recapitalization projects

Laboratory Services Section plans an upgrade to the Wilson Hall cafeteria food service facilities during FY06.

FIGURE 28 – Laboratory Services Section manages all housing for visiting scientific users. Much of the Fermilab village is used for this purpose.

G. Business Services Section

1. Mission: The Business Services Section (BSS) supports the Fermilab research program by providing various business services to all areas of the laboratory and user community, such as accounting, legal representation, procurement, transportation services, telecommunications and property/inventory control.

2. Facility assignments

Business Services Section manages the Fermilab warehouses, provides on-site transportation and disposals. As such, nearly 100% of its 94,000 GSF is warehouse and process facility space. The remaining space is used for storage and the gas station. The total RPV for these facilities is $5 million.

3. Facility Condition Index

The FY04 ratio of deferred maintenance to replacement value for Business Services 7 facilities is good, or 3.98%. A planned dock improvement at Warehouse #2 (FIMS #940) eliminates over 90% of the total BSS FY04 deferred maintenance.

4. Facility Issues

The average age of Business Services buildings is 27 years, based on weighted GSF. End of life issues will create a need for reinvestment in the near future. For example, Warehouse 1 (#938), constructed in 1975, has a 40,000 square foot roof close to end of life that requires more and more frequent repairs of small leaks.

5. Utilization

BSS facilities are 100% utilized.

6. Planned maintenance & recapitalization projects

Business Services Section's dock improvement project at Warehouse #2 is scheduled for FY06.

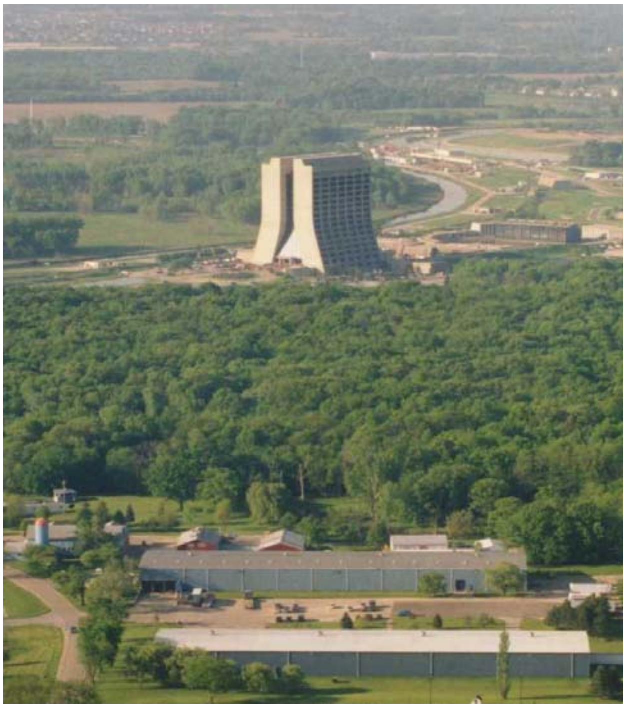


FIGURE 29 – Among other responsibilities, Fermilab's Business Services Section manages the site's warehouse facilities, shown in the foreground.

H. Facilities Engineering Services Section

1. Mission

The Facilities Engineering Services Section (FESS) Mission is to establish and maintain a dependable base from which high energy physics and other programs can be safely accomplished without interruption.

2. Facility assignments

FESS operates 34 buildings totaling 679,000 square feet of space, with a total RPV over $129 million. The sixteen-story administration building for the site, Wilson Hall, is managed by FESS, and contains nearly 25% of Fermilab's total building space, and 20% of the site's total building RPV. Each Division and Section occupies space in Wilson Hall. As an integral infrastructure support facility, the Central Utility Building provides hot and chilled water for Wilson Hall and the complex of buildings adjacent to it. Most of the original site barns are assigned to FESS, providing material storage space. FESS also serves as landlord for office/shop space for its various in-house trade organizations.

FIGURE 30- As manager of the site's conventional infrastructure, FESS oversees the site's infrastructure support facilities, such as the Master Substation.

3. Facility Condition Index

The FY04 ratio of deferred maintenance to replacement value for FESS is excellent, or 1.27%. Considerable investment has been made recently at both the Central Utility Building and Wilson Hall through a series of third-party investments from the Utility Incentive Program and line-item safety improvements project.

4. Facility Issues

FESS' greatest challenge is the management of the aging site utility systems, including roads. Many of the systems are approaching 40 years old, and require considerable investment.

FESS requires spare parts storage capability as the primary infrastructure and general maintenance provider for the site. The collection of original barns and other distributed facilities do not provide for this need in an efficient, organized fashion. The average age of FESS facilities is 35 years, based on weighted GSF.

5. Utilization

FESS facilities are currently 100% utilized. A large percentage of the space outside of Wilson Hall is used for storage of spare parts or seasonal equipment.

6. Planned maintenance & recapitalization projects

GPP projects are currently planned for the electric, sanitary, industrial cooling and domestic water utility systems.

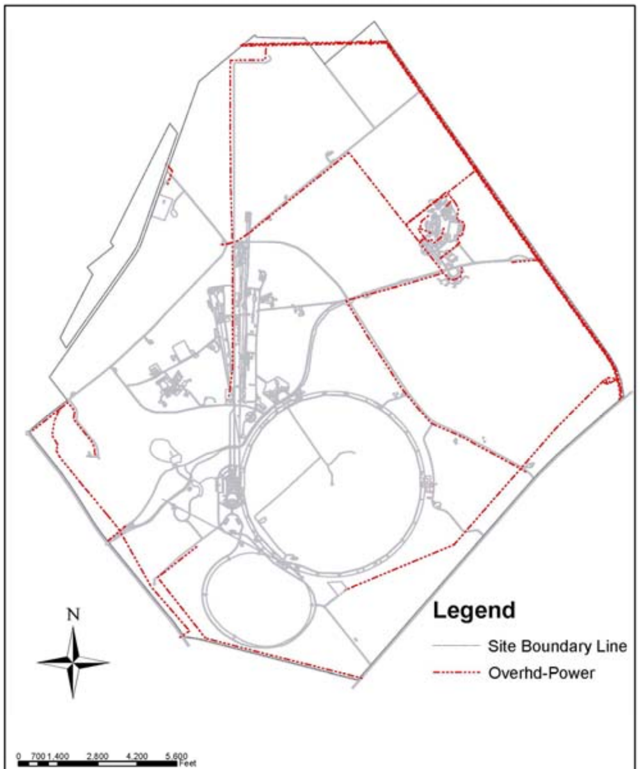
PART 5 SITE UTILITY SYSTEMS

Fermilab's utility systems cross all areas of the site. The village utilities typically predate other portions of the site infrastructure. The capacity, condition and deferred maintenance associated with the electrical, pond water (industrial cooling), domestic (potable), gas, and sanitary (wastewater) systems are described in this section and in general require a level of increased investment that is programmed for some of these systems.

A. Electrical System

1. Description (Figure 31): Electric power for the Fermilab Main Site is provided by Commonwealth Edison Company from their 345 kV transmission lines with over 26,000 mW of electrical generation and supply contracts for Northern Illinois. Transmission line 11120 is the preferred line between the Electric Junction and Lombard Substations, with Line 14419 between the Electric Junction and Wayne Substations serving as the second source of transmission to the site. The 345kV bus at the two Fermilab owned and operated high voltage substations, Kautz Road and Master Substation (Figure 30), is transformed through seven (7) 40 mVA and one (1) 60 mVA transformers to 13.8 kV for underground distribution through 46 feeder breakers. Fermilab secondary electrical distribution consists of approximately 240 substations with 15 miles of overhead service and 90 miles of underground cable. In addition, 34.5 kV lines from Electric Junction serve the Village 12.4 kV overhead distribution system and provide emergency 13.8 kV from the Village and Giese Road.

FIGURE 31



Fermilab Site - Overhead Utilities

2. Current Condition (reliability): The overall current condition of Fermilab electrical power system is marginal. However, planned investments over the next five year period will significantly improve reliability of this critical infrastructure system. The new components installed under the main injector project and selected feeders upgraded within the last few years are rated as good. Other secondary systems including transformers and conductors, as well as some primary 13.8kV feeders have elements that are rated as poor based on their current condition. The lab's original 345kV wood pole-line is in urgent need of replacement. As critical systems are identified as vulnerable or as failures have occurred, those sections have been replaced. An unfunded Line Item project to replace the 345 kV wood transmission structures and selected 13.8kV feeders has caused the laboratory to program operating funds to help remedy the unacceptable situation and an initiative with the neighboring City of Batavia may allow for private investment in some of the lab's electrical infrastructure through issuance of a Public Utility Easement.

FIGURE 32 – The 345kV wooden power poles, designed by Fermilab's first director Robert R. Wilson, in need of immediate replacement.

3. Deferred Maintenance: on the Fermilab electrical system is substantial at $14 million for FY04. Most significant is the original 345kV transmission line (Figure 32) that has the potential to adversely affect accelerator operations. System improvement projects currently included in the GPP program will eliminate the majority of the deferred maintenance.

4. Available Capacity: The current available capacity of the Fermilab electrical system is limited by the available high voltage substation capacity of 340 mVA (approx. 320mW). This total capacity offers considerable excess capacity for load growth. Fermilab's peak electric demand has reached an historic high of 80mW with current nominal operating base loads during accelerator cryo operations of between 35mW and 55mW offering substantial increased available capacity. This capacity is only limited geographically by the location, size and condition of feeders. Additional capacity to the Fermilab site beyond the available capacity is as close as the utility owned 345kV transmission lines that cross the Fermilab site. These lines could also be used to supply increased electrical capacity that may be needed for future requirements.

B. Pond Water Systems

1. Description (Figure 34): Fermilab provides its own Industrial Cooling Water (ICW) from precipitation and site sources and when needed is able to draw make-up water from the Fox River under a State of Illinois permit (Figure 34). The Industrial Cooling Water system at Fermilab has a dual purpose. It is used to supply water to the various fire hydrants and fire protection sprinkler systems located in buildings across the site and as a makeup water source for other site pond systems. These other pond systems generally have their own pumping and piping systems that supply process cooling water to heat exchangers around the site. In addition, ICW is utilized in many areas as a source for HVAC and process cooling. The distribution system for ICW extends from the main pumping station at Casey's Pond to the Support Area, Wilson Hall, the Footprint Area, and most of the Experimental Areas located on the Fermilab site. These experimental areas range from the Main Injector to the DZero facilities around the Tevatron ring. The main storage reservoir for the ICW system is Casey's Pond (Figure 33) which is located in the northern portion of the Fermilab site. A secondary storage facility was recently dedicated in honor of former DOE Fermi Area Office Manager Andy Mravca.

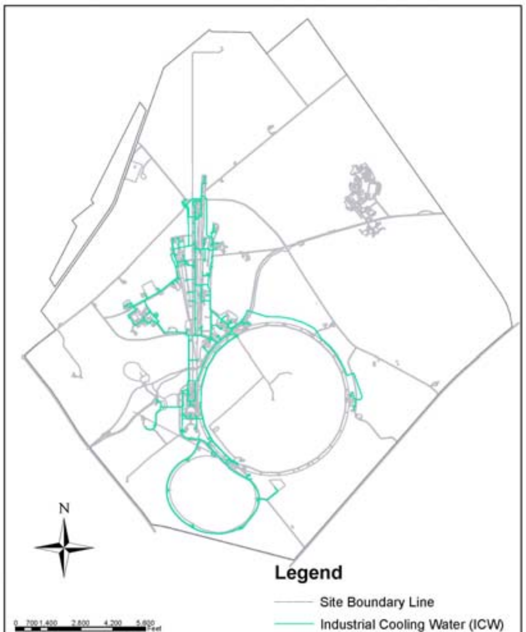
FIGURE 33 – Casey's Pond & Andy's Pond provide reservoir capacity for the site ICW system.

2. There are three sources that provide water to the reservoir. First, a site-wide network of lakes and ditches is used to collect runoff water from the northwest area of the site. Heat exchanger and sump discharge water is also returned to the main reservoir at Casey's Pond. Runoff water is also collected in the Main Ring Lake, located within the main accelerator ring, and AE Sea/Lake Law, in the southeast portion of the site. The water from these lakes is then transferred to the main reservoir by means of the C4 pumping station located at the Main Ring Lake which also serves as a limited emergency backup to the Casey's Pond Pumphouse. It is important to note that much of the entire Fermilab 6,800 acre site provides runoff to this network of ditches and lakes and thus even open areas of the site contribute to the experimental effort of the

Laboratory. As a second supply source, the State of Illinois allows Fermilab, when water flows are sufficient, to draw from the nearby DOE-owned Fox River pumping station to supplement and maintain capacity at the main reservoir. Continuous dewatering from the deep tunnel for the NuMI tunnel/MINOS experiment offers a third water source.

3. Current Condition (reliability): The current condition of the Fermilab Industrial Cooling Water (Pond water) system is adequate. The surface water components are projected to decline over the next five years due to limited infrastructure funds being planned for more critical systems. The piping systems are projected to increase in reliability based on significant GPP funding planned over the next five years. The main reservoir has been expanded in the last few years for increased capacity and gas-fired turbines (while near the end of life) provide a dual fuel source for a pumping system that is rated as good. Additionally, a backup electrical supply was recently completed to improve reliability of this system. Completion of a new utility corridor allows more effective transfer of water across the site and allows for further redundancy of supply for this critical Fermilab system.

FIGURE 34



Fermilab Site - Industrial Cooling Water Utility

The adequacy of the DOE owned Fox River pumping station is under review based on removal of a downstream dam that will permanently lower the water level of the river. Discussions are underway with the dam owner, Kane County Forest Preserve District, in order to preserve the lab's pumping capability.

The site has about 88,000 linear feet of piping for this non-potable water distribution system some of which is nearing the end of its useful life. The most critical sections with the highest vulnerability to fail have been identified and are planned for replacement. The ditch return systems and pond water control systems are in need of repair more from a water conservation standpoint but are satisfying the current capacity needs.

4. Deferred Maintenance: Of the 88,000 LF of ICW piping, approximately 67,000 LF has exceeded its useful life, and requires replacement. Load modifications two years ago, reduced the system operating pressure from 80 psi to 65 psi. This action has controlled the growth in system breaks since that time. However, each failure investigated and repaired continues to demonstrate the extensive deterioration throughout the older sections of the system. System improvements projects currently included in the GPP program will eliminate the

majority of the deferred maintenance.

5. Available Capacity: The present total capacity of the on-site ICW supply system is limited by the distribution system piping and is near 12,000 gpm. A maximum cooling demand of near 70 MW can be accommodated through the surface pond group of Casey's Pond (main reservoir), Tevatron, Main Injector and CUB ponds with their associated pumping facilities. Building #855, the pumping station at the main reservoir, contains 3-5,000 gpm primary pumps with variable speed capacity and 4-1,000 gpm single-speed secondary pumps which supply water to the site-wide ICW distribution system. The average pumping output of the Casey's Pond Pumping Station is primarily driven by cooling loads and the water temperature of the reservoir supply. This temperature varies with the time of year and the amount of experimental equipment requiring cooling. In the winter months, with minimum cooling demand from equipment, the output is usually below 4,000 gpm. In the summer months, with a maximum cooling demand, the output could exceed 6,000 gpm.

Additional pond water systems existing on the Fermilab site (not connected to existing 70MW pond system) could accommodate another 150MW of possible future cooling load for a total potential site cooling capacity of 220 MW.

C. Natural Gas

1. Description (Figure 35): From two separate metered source points, gas is delivered to Fermilab by NICOR and purchased under a supply contract with the Defense Energy Supply Center. The primary gas supply is an 8-inch line metered at the Wilson Road boundary. Two branch lines extend south. One serves the Village while the other serves the main site and terminates at the Central Utility Building. A second 4-inch back-up line supplies gas through a meter station at the west boundary of the site, adjacent to Giese Road. This line is connected near the Central Utility Building gas supply. Through a system of sectioning valves, limited gas supply

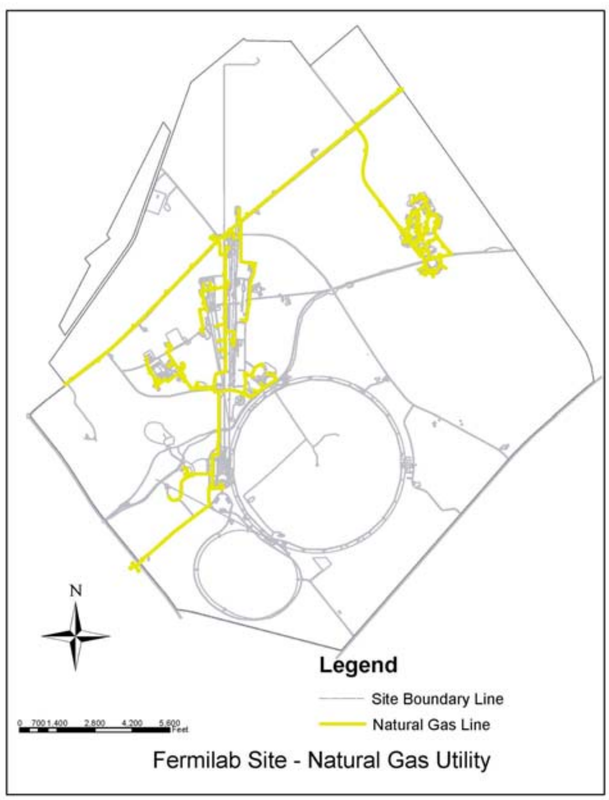


FIGURE 35

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can be maintained to the site in the event of an interruption of the 8-inch primary supply. The pressure site-wide is regulated to maintain 100 psi. The Village and Site 38 are regulated to maintain 60 psi. Natural gas is primarily used for heating; however, it is also used to drive turbine engines for generating emergency electricity at Casey's Pond, Well #3, the Master Substation, and Wilson Hall. Recent completion of a compressed natural gas (CNG) station supports the vehicle alternative fuels program. The site has approximately 89,000 lineal feet of underground natural gas piping owned by the federal government and maintained by Fermilab. Fermilab currently consumes around 100,000 Deka-therms (MMBTU) per year which equates to about one hundred million cubic feet of gas supply.

2. Current Condition (reliability): The current condition of the Fermilab gas system is good.

3. Deferred Maintenance: Metering and pressure reduction points at each facility require restoration or replacement. The underground portions of the delivery network show very limited deterioration.

4. Available Capacity: Fermilab natural gas use is modest using gas industry consumption per facility area standards and will remain in this category even considering continued equipment fuel switching from electric/propane to natural gas and increased use of a site fueling station for alternatively fueled (CNG) vehicles. The current available capacity of the Fermilab Natural Gas System could supply 4 to 5 times the current consumption and would be restricted at that point only by limitations of pressure drops in the distribution system. Large high-pressure pipelines crossing the Fermilab site could also be used to supply increased capacity for future requirement.

D. Potable Water

1. Description: There are two main and five minor domestic water supplies that provide domestic water to the various areas of the Fermilab site. The Main Site system supplies domestic water through a piping network to the majority of the facilities on site. The primary water source for this system is Well No. 3, located north of Road B near the Receiving Road intersection. Water is pumped from the well into a 50,000-gallon reservoir adjacent to the plant. There it is chlorinated and then pumped through the main site distribution system. The secondary source for this system is Well No. 1, located near the Central Utility Building. When Well No. 3 is not in use, water is pumped from Well No. 1 into a 50,000-gallon reservoir at that well site. The main site domestic water system will be connected to the village domestic water system in the near future (Figure 36). This will allow the main site to receive domestic water from the city of Warrenville and to relegate Well No. 3 to emergency backup status. The main site water system is owned and operated by Fermilab.

   Domestic water is supplied to the Village Residential Area and the Village Technical Area by a direct-metered connection to the community water supply

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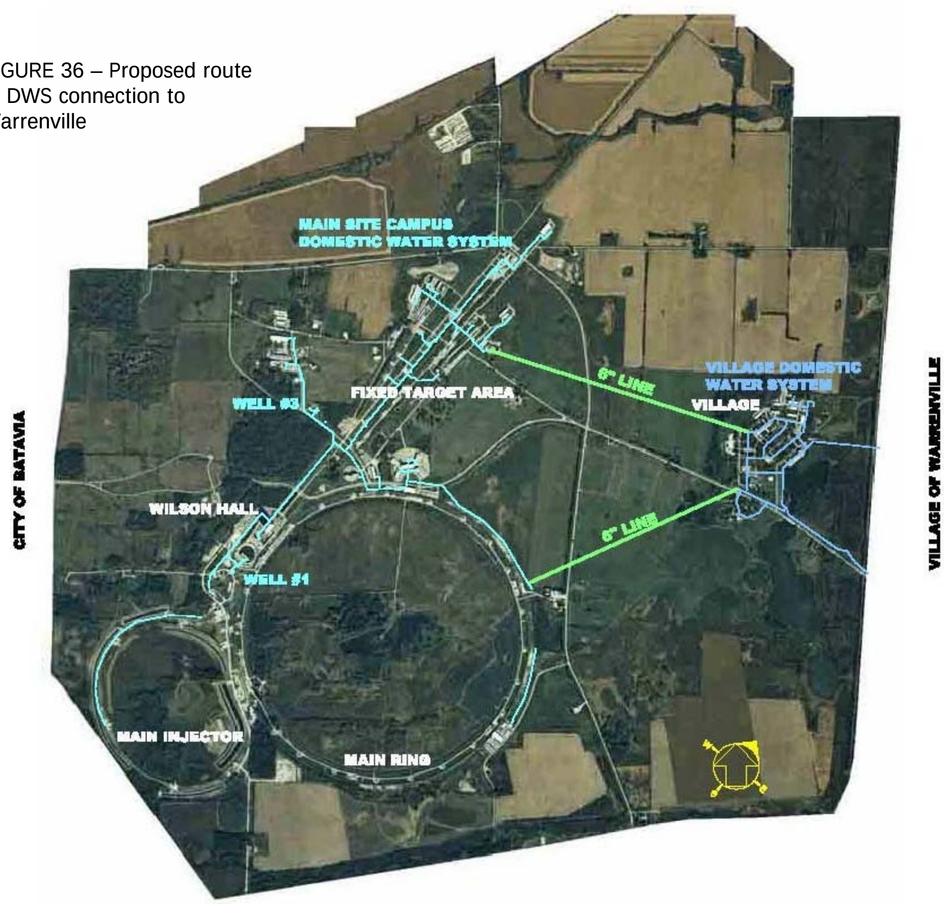
of the neighboring city of Warrenville. This village system, also Fermilab-owned and operated, is currently a separate distribution system independent of the main site distribution. In addition to potable water, this system provides the source of water for the fire protection systems located in the Village Areas.

Three additional shallow water wells serve individual buildings at outlying sites. These are wells associated with the farm sites that existed when the Atomic Energy Commission originally acquired the land. They are kept in service to supply water to their adjacent, former farm residences and storage buildings, which are still utilized for various laboratory requirements.

FIGURE 36 – Proposed route of DWS connection to Warrenville



2. The current condition of the Fermilab potable water system is marginal.

3. Deferred Maintenance: A majority of the Village distribution system has been replaced and the balance requires replacement. The main site distribution systems are in need of repair as they have reached end of life. With connection of the main site to the Warrenville supply, a GPP project, deferred maintenance on the main well system will be mitigated.

4. Available Capacity: The aquifer from which Fermilab wells draw water is in good condition and recharges at a rate sufficient to supply ongoing water requirements to Fermilab and neighboring communities. Wells at Fermilab have gradually deteriorated in their ability to draw water from the aquifer in recent years and require relocation or supplemental wells to meet Fermilab's needs. The site has 64,000 linear feet of piping used for potable water distribution. Total capacity of pumping stations used for potable water is about 2000gpm. Current consumption averages 50,000 gallons per day with peak demands requiring concurrent use of both wells. Connection to the village domestic water system in FY05 will substantially increase the main site capacity.

E. Sanitary Sewer

1. Description (Figure 37): There are two (2) underground sewage collection systems at the Laboratory. One serves the main site, and the other serves the Village area. The main site collection system has 22 lift stations; the Village system has one. No sewage is treated on site. Sewage from the main site is delivered and treated on a fee basis by the City of Batavia. Sewage from the Village is handled by the City of Warrenville under a similar arrangement. Fermilab owns and operates the sanitary collection system. The sewage system at the site contains 53,000 linear feet of gravity feed sewage line, 14,000 feet of pressure fed sewage line, and septic tanks with a capacity of 9,000 gal.

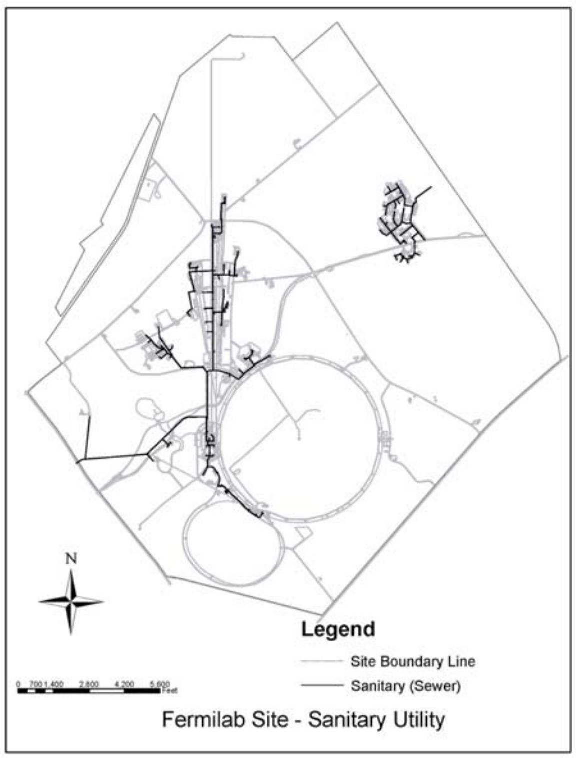


FIGURE 37

2. Current Condition (reliability): The collection system serving the main site facilities is marginal. A recent inflow and infiltration study has been completed that identified necessary repairs and improvements to this system to increase operating efficiencies and improve the capacity of the collection system. Off site collection of Fermilab's wastewater by the City of Batavia is adequate.

3. Deferred Maintenance: Maintenance repairs required to minimize groundwater infiltration include replacement of pipe and manhole vaults. Some deeply buried sections are suitable for use of pipe bursting or relining in lieu of replacement. One large gravity section can be replaced with a pressure system. System improvement projects currently included in the GPP program will eliminate the majority of the deferred maintenance.

4. Available Capacity: The current collection capacity of the Fermilab sanitary sewer is well above the current monthly average discharge of 3,500,000 gallons. Capacity of both the Batavia and Warrenville wastewater treatment plants are adequate for current requirements and future requirements based on projected growth of their municipalities and can accommodate future increases from Fermilab. A limitation, if any, for future Fermilab sanitary requirements would be in the collection systems of Batavia and Warrenville (Naperville) as sanitary effluent is transferred from the Fermilab collection system to the neighboring municipalities. Fermilab has a good working relationship with both City Engineers and Public Works Departments and continues to share information on many infrastructure related issues. Although not anticipated, other possible options for increased sanitary capacity could consider onsite treatment including a land application treatment as adopted by some neighboring municipalities.

PART 6 DISPOSITION

Disposition of Fermilab real property assets that have been identified as no longer needed (the process described in Section IV, Part 3, Director's Policy No. 36 – Facility Reuse Program) has been initiated by nominating these facilities for funding through the Office of Science Excess Facilities program.

FIGURE 38 – The demolition of Site 50, Shed B, was accomplished in November 2003 with funding from the Office of Science Excess Facility Disposition

Fermilab's excess facility program has developed recently, with the help of the SC's Excess Facilities Program, by motivation of the preparation of this TYSP as well as future mission planning at Fermilab. Projects have been submitted to SC's SLI Excess Facility Disposition program, many in support of the Particle Physics Division's Master Planning. In FY04, in addition to the demolition of 774 GSF at Site 50 Shed B (Figure 38), the Bubble Chamber equipment removal permitted reuse of 1,280 GSF in Neutrino Lab B (Figure 29). Further, 3,622 GSF of muon enclosure beamline have been demolished. As part of the Lab's Master Planning process, Fermilab is investigating space consolidation and additional excess actions to support the newly established requirement commencing in FY03 for offsetting demolition square footage for each new construction project that adds building space. However, with the addition of any new mission described in Section II, the lab will likely not be able to meet the space banking requirements from Fermilab demolitions so will likely be requesting a waiver and space banking support from other sites. We expect this SC excess facilities disposition program to continue to be the principal funding source for facilities that are identified for disposition. Potential future excess projects are being reviewed and considered for future nomination within FY06. Eight real property trailers and five buildings are currently slated for demolition with FY05 funding. These actions will remove 8,533 gsf from the Fermilab inventory. This demolished space, combined with 1836 gsf of demolitions in FY03 and 1494 gsf in FY04 will be used for the Computing Division's GCC 6305 gsf addition, leaving a balance of more than 5000 gsf in Fermilab's space bank.

PART 7 VALUE ENGINEERING

Fermilab applies a formal Value Engineering (VE) process, including elements of sustainable design, to projects with a single subcontract value in excess of $5,000,000. The VE process is implemented primarily by A&E consultants subject to oversight from the Laboratory. For projects below this limit, it is not anticipated that a separate value engineering exercise will be required.

However, internal reviews of designs at various levels of completion will be performed by the most experienced individuals at Fermilab to identify more cost effective solutions. These internal reviews will focus on understanding the impact of the technical requirements on the overall project. Project elements are optimized to reduce their life cycle costs and impact on natural resources, and create a healthy and comfortable work environment without sacrificing program objectives. Fermilab designs will incorporate maintainability, aesthetics, environmental justice and program requirements to deliver a well-balanced project.

PART 8 FIVE YEAR SUSTAINMENT PLANS

The Facility Engineering Services Section provides preventive and corrective maintenance for Fermilab's conventional electrical and mechanical equipment. Occupant organizations identify, fund, and accomplish the remainder of facility sustainment requirements, including those activities accomplished in concert with other GPP or line item projects.

The Whitestone Facility Maintenance Cost Forecast System is being used to assist the respective building managers by providing a zero-based life-cytemplate of typical sustainment requirements for the installed components at each facility. Work items are based on site-wide typical experience, and may not directly correlate to plans or experience at individual facilities, but they do provide a consistent reference frame for development of sustainment plans.

The zero-based sustainment plan reports summarize incremental costs for each item of preventive maintenance, statistical models of corrective maintenance based on the preventive work, major repairs and life cycle replacements based on industry standards. Cost detail is shown by building UNIFORMAT and type of work. These reports reflect typical budget plans for the work to be accomplished by FESS and the property manager. Large, infrequent investments, such as reroofing, can be identified, and reprogrammed to normalize the expense profile within an organization over a period of years. The resulting plans balance the needs against realistic funding projections and long-term facility use plans.

Sustainment plans for utilities and other structures are based upon repair or recapitalization needs identified through engineering analysis combined with the requirements identified by the system operator.

PART 9 MANAGEMENT OF DEFERRED MAINTENANCE

Fermilab's management of building deferred maintenance differs from its management of deferred maintenance for other structures and facilities (OSFs). For buildings, Divisions and Sections (D/S) are assigned management responsibility, including the success of the program in the building. In addition to their responsibility for maintenance and the safety of the operations conducted in their facilities, they develop building sustainment plans based on programmatic needs and priorities and the lab's desire to maintain world-class facilities. Based on the current funding climate, maintenance is sometimes deferred beyond the optimal period, for functions that do not adversely affect mission accomplishment. Maintenance so deferred is reported annually to lab management and in FIMS and is monitored for all Divisions and Sections in the Facilities Engineering Services Section. Subsequent maintenance prioritizations undergo review by the office of the lab Director to ensure facility management accountability. Fermilab's favorable Asset Condition Index (Section IV, Part 4) reflects the process' merits.

Alterations and improvements are made to buildings throughout their life cycle. When these projects reduce deferred maintenance, it is reflected in the responsible D/S annual deferred maintenance reports to lab management.

FIGURE 39 - Deferred maintenance on E0 Gas Shed (#261) includes a failed roof. Fermilab is developing plans to demolish this 96 GSF facility.

Extraordinary building maintenance, which recapitalizes major components or building systems, may be eligible for GPP funding. Submitted projects are prioritized for GPP funding by the Office of the Director. When accomplished, these projects may reduce deferred maintenance, which is reported annually by the responsible D/S.

The FY04 deferred maintenance for buildings is just over $7 million (Figure 21, Section IV, Part 6). Eighty percent of the FY03 to FY04 increase (49%) in deferred maintenance is confined to eight buildings, including miscellaneous mechanical repairs in Wilson Hall, exterior concrete restoration in Feynman Computing Center, ramp at Warehouse #2, cooling at the Footprint complex, roofing at the Industrial Center Building, HVAC at Proton Service Building 1, crane repairs at the Neutrino Lab NWA and HVAC at Neutrino Service Building 1 for a total FY04 deferred maintenance backlog of $2.3 million. The backlog increase is attributable to an aging complex and an enhanced cooperation among the management entities to identify the deficiencies.

Routine maintenance responsibilities for OSFs are assigned to specific system owners, typically FESS. OSF assessments are periodically updated to fairly represent their current operating condition. This is an ongoing process, factoring system or component age, efficiency, safety and environmental compliance, maintainability, failure history, locations and conditions found during repairs, current mission needs, and future requirements. Deferred maintenance on utility systems has increased dramatically over recent years due to more detailed assessments of the aging infrastructure systems. In FY04, $33 million in OSF deferred maintenance included primarily utility systems. Utility system deferred maintenance is due in large part to ongoing inspections validating increased deterioration of these systems. The resource matrix included in the appendix identifies significant multi-million dollar GPP investments planned for the next several years that will reduce the high voltage electrical, domestic and industrial water systems backlog. The laboratory expects the special funding from the Office of Science "Deferred Maintenance Reduction" program will play a significant role in the lab's control and management of deferred maintenance.

Requirements to reduce deferred maintenance are identified and scoped by the system owner, and, if appropriate, prioritized for GPP funding by the Office of the Director. Prioritization of these projects is based on risk levels associated with safety, mission, and environment and the probability of failure of a particular system. Projects are ranked for funding using the following approach:

Each project is ranked on a risk scale of 1-5, based on four factors:

- Safety — Is it a threat to personnel safety?
- Vulnerability — Is it mission critical?
- Reliability — Will its loss impact the mission?
- Redundancy — Does the equipment have a back up?

The risk is then compared to the probability of failure to establish an urgency rating.

Risk Level To Safety Mission Environment		Low	Medium	High
	1	C	B	A
	2	D	C	B
	3	E	D	C
	4	E	E	D
	5	E	E	E
		Probability of Failure		

Repair Code
A - Immediately
B - Within a Year
C - As Soon As Possible
D - Maybe Yes/No
E - Never

FIGURE 40

In addition to objective criteria including line fault and pipe break histories, this approach requires subjective judgments related to the rankings of various projects by the Office of the Director. In the funding-competitive environment at Fermilab, the ranking scenario creates a system ensuring that facility repair and recapitalization requirements with significant mission interruption potential are appropriately prioritized. (Figure 48)

In the following table, the DM backlog is displayed according to mission risk and probability of occurrence, using the Capital Asset Management Process prioritization approach. As expected, Fermilab's OSFs rank highly on this analysis.

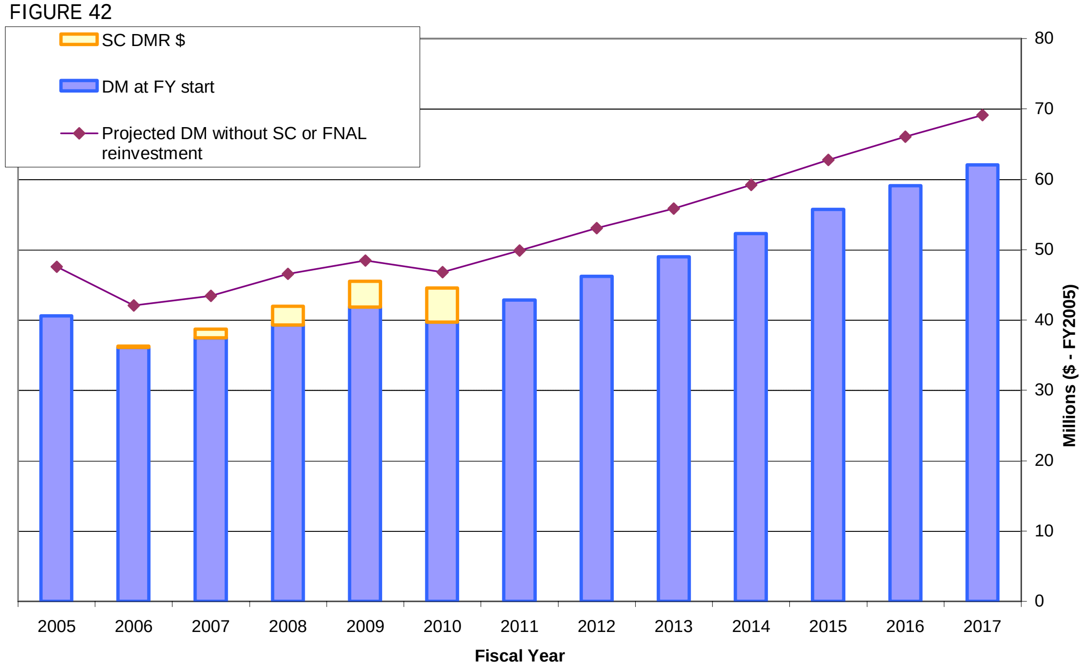
FIGURE 41

CAMP	FIMS		FY04 DM
62	7112030127	Elec Onsite Trans Lns	$4,740,165
61	7113030128	Elec Dist Lines, Secondary	$11,310,165
60	7132030132	Water Sys Other Wtrlines	$7,789,619
55	7131030131	Water System Potable Dist	$2,949,755
52	150	39 Shabbona-Material Dev. Lab	$66,080
52	206	Booster Gallery East & West	$416,593
51	7164030142	Cooling Ponds & Reservoirs	$2,138,763
50	PUMP STN	Fox River Pumping Station	$131,400
48	7154030138	Swge Coll Sys Gravity	$700,990
47	149	37 Shabbona-Material Dev. Lab	$23,037
47	179	27 Winnebago - Lab 1	$228,601
47	207	Booster Tower Southwest	$377,674
47	208	Booster Tower Southeast	$397,969
47	404	Ms-2 Meson Service Building	$147,483
46	7142030136	Gas Dist Sys Lines	$380,730
46	STORMWTR	Stormwater Piping Gravity & Pressure	$496,400
45	093	36a Neuqua - Lab 5 Pole Bldg.	$38,467
45	944	Site 50 Barn	$95,922
45	LATERALS	Laterals, Ditches & Culverts	$365,000
44	940	Receiving Warehouse #2	$201,661
40	106	32 Winnebago - Lab 4 House	$22,658
40	108	40 Shabbona-Lab 4 House/Office	$21,900
39	148	37a Shabbona-Material Dev. Lab	$21,900
39	182	38 Shabbona - Lab 4	$132,746
39	184	32a Neuqua- Lab 6 Butler Bldg.	$105,078
39	406	Ms-3 Meson Service Building	$74,924
39	803	Industrial Shed #2A	$6,929
36	283	Switchyard Service Building	$65,472
35	094	38 Neuqua - Lab 5 House	$29,987
35	095	36 Shabbona - Lab 5 House	$29,200
35	102	27a Winnebago - Lab 1 House	$29,441
35	103	27b Winnebago - Lab 1 House	$29,200
35	104	27c Winnebago - Lab 1 House	$29,580

CAMP	FIMS		FY04 DM
35	930	Site 38 Barn	$149,370
35	942	Site 49 Barn	$68,029
33	809	Magnet Storage	$38,015
23	993	Site 65 Storage Building	$1,460
23	7134030134	Water Sys Potable Wtr Wls	$381,279

Fermilab recognizes that continued additional reinvestment will be required to control deferred maintenance growth. The following chart reflects the current plans for this reinvestment to offset the normal aging, deterioration, and predicted end of life of building components and infrastructure systems.

FIGURE 42



As can be seen in Figure 42, projected GPP investment and planned funding through the Office of Science Deferred Maintenance Reduction Initiative reduces the existing DM and controls the forecasted growth through FY11 with a fair degree of confidence. FY12 – FY17 DM at this point is simply forecasted based on age of systems and associated estimated deterioration rates.

PART 10 CONTRACT PERFORMANCE MEASURES

A. The FY05 contract performance measures in the area of infrastructure management included the following objective:

Establish and maintain a dependable facilities base from which particle physics and other Fermilab programs can be safely accomplished without interruption.

This objective identified three measures and associated metrics. For the first two measures, FY04 accomplishments are described below:

1. Maintenance is performed as scheduled. For this measure, the laboratory used the computerized maintenance management system (CMMS) to identify that the laboratory achieved an annual rating of outstanding from exceeding the 80 percentile and only fell below this level in one month but remained in the excellent category.

2. The implementation of Whitestone's Maintenance and Repair System (MARS) Program will assist in forecasting building requirements and identification of end-of-life systems to support condition assessments and deferred maintenance management. In FY04 the Whitestone process was initiated in 35 buildings with the four largest of those building forecasts being reviewed by the building manager in coordination with the FESS infrastructure condition assessment administrator. This process is an important component in the requirement to conduct prescriptive condition assessments on each real property asset at least once every five years per the DOE RPAM order, and this effort will result in more effective infrastructure management for the laboratory. Based on the Whitestone model being completed in 35 buildings, this measure obtained an adjectival rating of outstanding.

3. Level of maintenance investment in real property assets. MII is calculated by dividing the total annual contractor funded maintenance for active conventional facilities by the Replacement Plant Value from FIMS for these same facilities. The RPV to be used for this metric is $518,339,183 as determined in July 2004. Fermilab's FY04 investment percentage was 1.7%.

B. The FY06 performance measures are under discussion and will likely include some of the same measures as discussed for FY05.

C. Not included in the contract but required by the Office of Science is the agreement on Fermilab Energy Management Performance-Based Objectives and Measures for FY 2005-2006. These objectives and metrics will include the following:

1. Energy Management initiatives are managed consistent with a Comprehensive Energy Management Program and Plan (CEMP) that includes the minimum requirements of Department of Energy (DOE) Order 430.2A, Departmental Energy and Utilities Management. Included in this is a requirement to update the Comprehensive Energy Management Program and Plan (CEMP) to include

minimum requirements of DOE O 430.2A and the management system that evaluates contractor performance contains the Contractor Requirements Document (CRD) of DOE O 430.2A.

2. The second objective identifies Energy Use Reductions and Green House Gas reductions show continuous improvement and are on target toward meeting the DOE energy efficiency leadership goals consistent with DOE Order 430.2A. The formula for the measurement of this is identified as ((PY-CY)/PY) x 100 = percent reduction, where PY = previous year Building energy use requirement per Element 2 of the CEMP and CY = current year Building energy use per gross square foot as reported in DOE's Energy Management System 4. Energy use in the I&L category is determined by accelerator operations and is therefore specifically excluded from this gross square foot measure. The expectation is that Energy use in Buildings per gross square foot is 2 percent less than the CEMP requirement of the previous year.

3. Increased use of alternative funding to implement projects that can help reduce energy and water costs is another objective identified in this agreement being evaluated by the number of alternative financed projects under development. Alternatives include, but are not limited to Energy Savings Performance Contracts (ESPC), utility contracts, rebates, money back, cool choice programs, program office funding, etc. Projects will be developed in accordance with DOE O 430.2A, HQ policies, ESPC rules, and DOE legal opinions.

FIGURE 43 – Third-party investments in the utility systems contained within the Central Utility Building yield energy savings as well as improved infrastructure reliability.

4. Lastly, DEMP Retrofit Projects and Model Programs are to be completed in accordance with the schedules provided in the funding letters and DEMP funds are costed in a timely fashion with Status reports provided in May and November of each year that the project or model program remains incomplete and the reports indicate that the project or model program will be completed in accordance with the planned schedule.

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PART 11 TEN YEAR SITE PLAN DEVELOPMENT PROCESS

In cooperation with the Department of Energy's Fermilab Site Office (FSO), the Fermilab Office of the Director develops and annually updates the Ten-Year Site Plan (TYSP). An executive committee, appointed by the Director, develops policy, assigns responsibility, and assures continuity between the TYSP and other planning initiatives at Fermilab.

The Facilities Engineering Services Section (FESS) is assigned responsibility for collecting and compiling data, as well as drafting and editing the report for the director's executive committee. Each Division and Section submits condition, sustainment, and utilization data for their facilities, identifying facility needs that correlate to programmatic initiatives. The information is shared between organizations to ensure the support organizations' planning fulfills the appropriate need, and isn't redundant to the support facilities planned by others.

Recently, several different planning initiatives have helped Fermilab create a cohesive, comprehensive vision for the Lab's future. Director Mike Witherell authored his vision in the report "Discovery at Fermilab: The Next Twenty Years", on May 25, 2004, available at http://www.fnal.gov/pub/today/directors_corner/Future_of_Fermilab.pdf. His report summarized information from the report of the Fermilab Long-Range Planning Committee effort chaired by Associate Director Hugh Montgomery. The committee's May 2004, report "The Coming Revolution in Particle Physics", is available at http://www.fnal.gov/pub/today/directors corner/lrpreportfinal.pdf. These reports, combined with the Office of Science's recent "Facilities for the Future of Science, a Twenty Year Outlook", available at http://www.fnal.gov/orgs/fermilab users org/docs 03_04/20-Year-Outlook screen.pdf, serve as the framework for development of needs in the Fermilab Ten Year Site Plan. Funding and budgeting assumptions for the plan are based upon the annual program guidance provided by the Department of Energy. The summary mission outlook is summarized in Figure 14.

The scope and organization of the TYSP is suggested by the DOE in the Real Property Asset Management Order (DOE O 430.1b, available at http://www.directives.doe.gov/cgi-bin/explhcgi?qry1696910752;doe-177), and in annual implementation guidance provided at http://www.sc.doe.gov/sc-80/sc-82/documents/2005_tysp_guidance.pdf .

During the plan development process, the Facilities Engineering Services Section serves as facilitator to ensure that organizational goals are integrated into the capital decision making process. FESS helps the various Division/Sections in their determination of the gap between the capacity of current assets and needed capabilities. Alternative approaches, including non-capital approaches and third-party funding are considered. A GPP planning groups works with the Associate Director for Operations Support develop site-wide General Plant Project prioritization of infrastructure recapitialization projects, as well as facility alterations and improvements which reduce deferred maintenance.

In addition to specific TYSP guidance, the annual Director's review provides a forum for discussions to ensure that objective, specific, and regular feedback from the Divisions and Sections related to the condition and needs of facilities is obtained. Based on the overall site FCI, and the results of numerous audits and site reviews, this process is improving.

DOE's Fermilab Site Office provided input to the TYSP via the draft review prior to official submission of the plan to the Office of Science.

PART 12 FACILITIES INFORMATION MANAGEMENT SYSTEM

As the Department's database for Real Property, the Facilities Information Management System is the real-time record of all facility information at Fermilab and other DOE sites. Consistent with SC & DOE goals, Fermilab works to ensure that all facility data is current and accurate. Various efforts have recently been initiated to meet this goal, including improved coordination and communication at various reporting levels.

A. Overview

1. Practices and processes for Quality Assurance are outlined in Fermilab's FIMS QA Plan, updated in May 2005.

2. As part of Fermilab's QA efforts, a number of small original acquisition assets were identified as missing from the FIMS inventory. These assets added a collective 1720 gsf and $16,000 RPV to the Fermilab inventory.

B. Real Property Issues

1. Replacement Plant Value

Typically, Fermilab uses a method of Capitalized Plant Value (CPV) for calculating replacement values, relying on acquisition value, year, and capitalized improvements to determine RPV. This method applies an escalator based on construction year to original acquisition costs. As part of a QA review in FY04, Fermilab recognized that 16% of its assets – 38% of its original acquisition buildings - had original acquisition values below $5000, and thus extraordinarily low RPVs. Engineer's estimates, combined with square foot analyses, were used to improve the accuracy of the RPVs for these facilities.

As discussed in the Overview to Section IV, Fermilab's OSF RPV increased more than 20% this year due to recalculations of OSF asset replacement costs. Specifically, RPVs increased for: Primary Electrical, Secondary electrical, Domestic Water System, Industrial Cooling Water, Sanitary, Gas, Roads and Street Lighting.

2. OSF 3000: Conventional Facility Index & Maintenance Investment Index

As discussed in Section IV, Overview, Fermilab's accelerator asset (#701030125), commonly referred to as OSF 3000 (Research & Development OSF usage code) has an RPV of $746 million. This asset includes accelerators, tunnels, beam lines and enclosures. Capitalization actions for this asset date back to the inception of the lab and largely include Accelerator Improvement Projects (AIP). Much of the capitalized cost represents excavation or tunneling costs that do not require the same amount of ongoing maintenance as other conventional construction. Finally, standard sustainment levels seek to optimize ownership costs for real property over a period of at least 50 years. Accelerator assets have much shorter program lives, making standard maintenance investment levels inappropriate. In fact, over the past

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three years, less than $500,000 of maintenance on the conventional components of this asset has been needed on the $746 million accelerator complex.

The recently constructed NuMI Project, for example, is expected to be capitalized in FY05. The majority of the total project cost of approximately $170 million, is estimated to be programmatic. This expense becomes part of the RPV, but requires no maintenance. However, the mechanical and house electrical systems comprise the balance of the capitalized conventional cost and will require minimal maintenance.

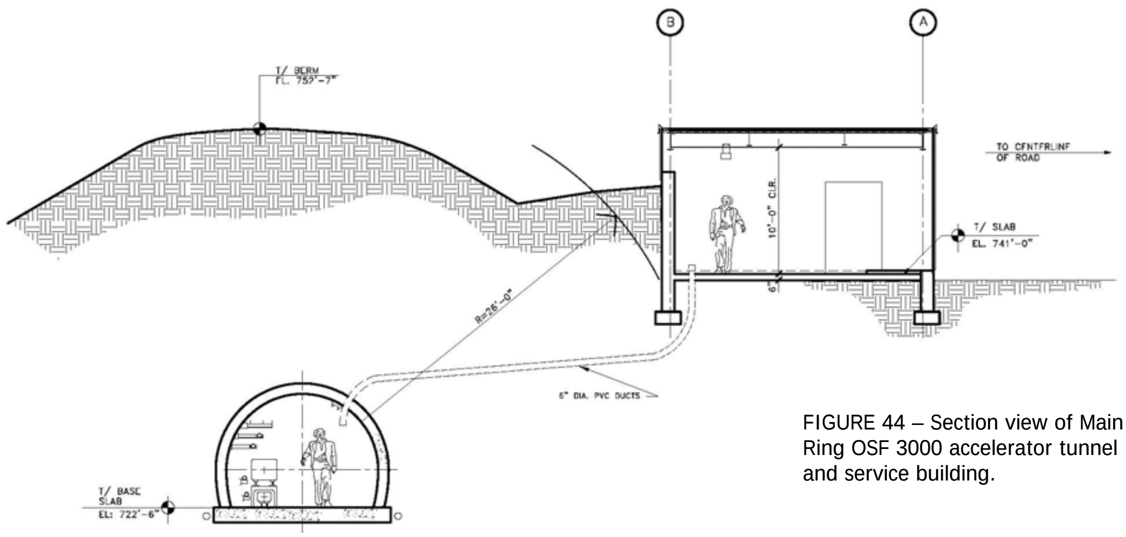

FIGURE 44 – Section view of Main Ring OSF 3000 accelerator tunnel and service building.

Fermilab's 99 accelerator buildings, 350,000 GSF (12% of total GSF) of facilities that provide mechanical and electrical support, as well as grade level access to the accelerator tunnel, are capitalized as buildings and carry a total RPV in FIMS of $83.3 million. In FY04, the percentage of actual maintenance dollars expended for these facilities totaled 1.6% of their RPV.

This discussion is the basis for Fermilab's position that our accelerator asset is entirely programmatic. This is indicated as such in FIMS where the Conventional Facility Indicator (CFI) equals zero for OSF 3000. SC defines CFI as the percentage of a FIMS asset that is deemed general purpose/conventional. Fermilab's 0% CFI accelerator asset was validated in May 2004 by the analysis of Dan Dresser, SC consultant. His report concluded that "The single OSF 3000 record is for the entire accelerator machine, which includes several different pieces that make up the machine. . . . Fermilab's single OSF 3000 item, while large in value, does include only the accelerator and not the buildings."

We understand the Office of Science is planning to issue guidance for redefining the OSF 3000 CFI that may change the current Fermilab assessment of CFI. Fermilab's position was further validated by SC's

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September 2004 recommendation to OECM regarding the inclusion of OSF 3000 assets for maintenance investment calculations (MII):

> Tunnels associated with accelerators, whether underground or above ground, in which there is equipment (such as transformers, power supplies and other electrical equipment, HVAC equipment or water systems) that requires regular, active maintenance should be classified in FIMS as Building Use Code 785 – Accelerator Buildings. As such, they will be included in the calculation of the MII and be subject to the offset requirement for new construction and banking, if eliminated. Portions of tunnels (e.g., containing pipes or beamlines) in which there is minimal or no maintenance are excluded from these requirements."

Thus, the SC memo of September 8, 2004, calculated the Fermilab RPV baseline for Maintenance Investment at $518 million, which excludes the accelerator asset. Section IV, Overview includes additional discussion about Fermilab's current RPV.

3. SC Planning Information Fields

In FY03, SC added three new fields to the FIMS database. These fields were intended to help SC identify planned rehab and improvement investments in general purpose/conventional facility assets. Previously, such projections were included in the laboratory's Strategic Facility Plan. With these new fields, however, SC aimed to map facility plans in the SFP to the laboratory's assets. Further, this cost information was intended to support overall budget justification and out-year planning.

The first SC planning field, CFI, applicable only for OSF 3000 assets, is discussed above in B,1, titled, "OSF 3000: Conventional Facility Indicator and Maintenance Investment Index." The other two fields, Modernization and Planning Indicator and Rehab and Improvement Costs, are applicable for all real property assets and should be consistent with the resource requirements as defined in this document.

a. For each asset, the Modernization & Planning Indicator (MPI) reflects the plan for that facility, as summarized below:

   1 – indicates the asset will be replaced by another new facility
   2 – indicates the asset will be demolished without replacement
   3 – indicates the asset will continue to operate, with or without maintenance or Rehab and Improvement Cost investment (RIC).

   Currently, most of Fermilab's assets carry an MPI of 3. The Technical Division (TD) facilities that would be demolished as part of the Advanced Material Laboratory (AML) project have an MPI of 1.

b. Rehab & Improvement Costs (RIC) are the costs to rehab/improve/modernize a general purpose/conventional asset to support current and planned mission activities, excluding deferred maintenance costs. However, for facilities that are intended to be demolished rather than modernized, (i.e., those assets with an MPI of 1 or 2), RIC summarizes the estimated demolition and, if appropriate, the cost of the replacement asset. SC guidance also stipulates that the costs to bring an asset into code compliance should also be reported as RIC.

The Office of Science uses Rehab and Improvement Cost (RIC) to track modernization costs beyond Deferred Maintenance. RIC has been defined as the cost to rehab/improve/modernize a general purpose/conventional asset to support current and planned mission activities and was first required & populated in FIMS for FY03. Fermilab's FY03 RIC submittal matched summary costs outlined in the Laboratory's 2002 Strategic Facility Plan and included $38 million for buildings and $24 million for utilities.

For the FY04 RIC, Fermilab reported $27 million for buildings. Computing Division's expansion of its data processing capabilities represents the greatest portion of this RIC. For utilities, the RIC total was $8 million to upgrade failing infrastructure systems. As part of Fermilab's assessment of its OSF inventory, much of the FY03 RIC was re-categorized as deferred maintenance in FY04.

4. Federal Real Property Council

Executive Order 13327, signed on February 4, 2004, created the interagency Federal Real Property Council to establish guidance and criteria for federal management of real property. The first major action of this body was development of guidance for Improved Asset Management, including its Property Inventory Data Elements and Performance Measures. Many of these elements correlate to data in FIMS, but elements are unique. FY05 will be the first year that this data will be reported to the FRPC. Fermilab is working with SC and OECM to collect this data for FY05 and future reporting periods.

The resource requirements shown below in General Plant Projects (GPP) correlate directly to the FY07 Integrated Facilities and Infrastructure (IFI) cross cut budget project requirements for FY05 through FY11. As in the FY07 IFI cross cut, the lab has identified line items for Proton Driver and the Next Generation Computing Facility. Future submissions may include additional projects as planning continues for the future missions as described in this document. These requirements will be presented as items in future budget years as the TYSP describes progress in development efforts for conventional and programmatic needs to meet current and future mission activities.

Additionally, GPP projects shown after FY11 include the balance of projects for the other requirements identified throughout the TYSP, including deferred maintenance and Rehab and Improvement Costs. Accelerator Improvement projects, as well as possible line item projects of both a conventional and programmatic scope have categories included as future projects and will be identified in subsequent updates to the annual Fermilab TYSP.

The line item included in the unconstrained timeline below was discussed thoroughly in Section II, Mission. The Proton Driver and the International Linear Collider benefit from shared R&D. Each proposes to use high gradient superconducting cavities operating in pulsed mode to accelerate particles traveling near light speed. Information about the Next Generation Computing Facility is summarized in Section IV, Part 6, C. Computing Division.

Figure 45 summarizes all requirements by project category. Infrastructure needs and plans, FY05 through FY10, are summarized in Figure 46. GPP investments will be heavily directed toward the high voltage electrical system, as it presents the highest vulnerability to the scientific operation. Detailed breakdown is attached in the Appendix, “Resource Requirements Summary Matrix.”

FIGURE 45

Project Category	**IFI Constrained (FY05 - FY11)**	**Unconstrained (FY12 – FY16)**
Conventional Line Item		
Programmatic Line Item	**$140,000k**	**$400,000k**
GPP, New Construction	**$8,660k**	
GPP, All Other	**$57,030k**	**$67,955k**
AIP		

FIGURE 46

System	Need ($M)	Planned ($M)
Computing Bldg. Reuse Program	12.5	12.5
High Voltage Electric	21.6	17.4
Industrial Cooling Water	17.3	7.0
Domestic Water System	7.5	1.0
Sanitary System	5.2	2.3
Ponds and Ditches	9.0	0.0
Roads and Parking	5.2	2.7
Total	**78.3**	**42.9**

Summary Resource Requirements Matrix

Facility Summary Overview

List of Figures

List of Acronyms

List of Fermilab Buildings

2005 TYSP Resource Requirements Summary Matrix

2005 Ten Year Site Plan	Project Number	Gross Building Area	FY 05 Approp. ($000)	FY 06 Approp ($000)	FY 07 Budget ($000)	FY 08 Budget ($000)	FY 09 Budget ($000)	FY 10 Budget ($000)	FY 11 Budget ($000)	FY 12 Budget ($000)	FY 13 Budget ($000)	FY 14 Budget ($000)	FY 15 Budget ($000)	FY 16 Budget ($000)
SITE NAME: Fermi														
PROGRAM: HEP														
1.0 Capital Line Item														
1.1 New Construction														
Conventional														
Programmatic														
a. Proton Driver									80,000	125,000	125,000	100,000	50,000	
b. Next Generation Computing Facility								15,000	15,000					
1.2 Recapitalization projects (modernization)														
2.0 Accelerator Improvement Projects (AIP)														
3.0 General Plant Project (GPP) All projects are funded by HEP														
3.1 New Construction (facilities and additions)														
Advanced Materials R&D Laboratory		13,500		2,000	2,100									
Site Security Facility		2,500					560							
3.2 All Other Projects														
GCC Computer Room Upgrades			2,865	1,756										
High Voltage Electrical Upgrade Program			4,000	2,000	3,680	3,240	2,220	2,280	1,400	1,440	1,350			
Industrial Cooling Water System			140	2,350	840	1,405	1,110	1,140	1,170	2,280	2,340	2,395	2,150	
Sanitary Sewer System Rehabilitation							1,110	1,140	1,170	1,260	560			
Domestic Water System			688					275	585	1,500	1,540	1,575	1,300	
WH Food Service Upgrades				250										
Warehouse II Dock Improvements				200										
Emergency Services Building Improvements							1,890	1,800						
GCC Computer Room C Conversion				1,844	1,425									
GCC Computer Room D Conversion					2,355	1,465			340					
Road Rehabilitation						485	1,110	1,140	1,170	700	675			
Pond Water Systems													500	1,500
Booster Tower HVAC Improvements						1,405								
KRS Storm Sewer Restoration											50			
CUB System Upgrades			112					225	585	600	1,230	3,760	3,900	3,725
FCC Condenser Water Distribution System Upg									500					
FCC Office Improvements									350	1,800				
CD WH Office Improvements										840				
FCC Precast Concrete Infiltration Study and Recoating										330				
Facilities									440					
Surface Water System									290	900	4,920	5,040	5,200	5,320
Natural Gas System									290	900	1,540	1,575	1,600	1,660
GCC Tape Robot			795											
Chilled Water System														
Subtotal GPP			8,600	10,400	10,400	8,000	8,000	8,000	8,290	12,550	14,205	14,345	14,650	12,205

2005 TYSP Resource Requirements Summary Matrix

Integrated Facilities and Infrastructure Budget Data Sheet (IFI)	Project Number	Gross Building Area	FY 06 Approp ($000)	FY 07 Budget ($000)	FY 08 Budget ($000)	FY 09 Budget ($000)	FY 10 Budget ($000)	FY 11 Budget ($000)	FY 12 Budget ($000)	FY 13 Budget ($000)	FY 14 Budget ($000)	FY 15 Budget ($000)	FY 16 Budget ($000)
SITE NAME: Fermi													
PROGRAM: HEP													
4.0 Operating/Expense for Excess Elimination and Other													
4.1 Excess Elimination (demolition, sale, lease, transfer) Show area eliminated in Gross Area column													
Building Demolition		9,374	125										
4.1 Subtotal			125										
4.2 All Other (List direct O&E maintenance under 5.1)													
Utility Incentive Program			5,400	5,400	5,400	5,400	5,400	2,700					
4.2 Subtotal			5,400	5,400	5,400	5,400	5,400	2,700					
Subtotal Operating/Expense Projects			5,525	5,400	5,400	5,400	5,400	2,700					
TOTAL Overhead Investments (IGPP)													
5.0 Maintenance & Repair													
5.1 Direct Funded (by HQ or Site Program)			3,628	3,628	3,628	3,628	3,628	3,628	3,628	3,628	3,628	3,628	3,628
List direct O/E maintenance projects													
DMR (SC Deferred Maintenance Reduction Initiative)				1,365	2,520	3,675	4,830						
Total Direct Maintenance & Repair			3,628	3,628	3,628	3,628	3,628	3,628	3,628	3,628	3,628	3,628	3,628
5.2 Indirect (from Overhead or Space Charges)			6,738	6,738	6,738	6,738	6,738	6,738	6,738	6,738	6,738	6,738	6,738
Include indirect O/E manitnenance projects in total													
Total Indirect Maintenance & Repair			10,366	10,366	10,366	10,366	10,366	10,366	10,366	10,366	10,366	10,366	10,366
6.0 Indirect O&E Excess Elimination (demolition, sale, lease, transfer) Show area eliminated in Gross Area column													
NONE													
Total Indirect Excess Elimination													

Fermi National Accelerator Laboratory
2005 Facility Summary Overview

Infrastructure Issues

Fermi National Accelerator Laboratory advances the understanding of the fundamental nature of matter and energy by providing leadership and resources for qualified researchers to conduct basic research at the frontiers of high energy physics and related disciplines. To serve that goal, the infrastructure support & maintenance functions work to establish and maintain a dependable base from which particle physics and other Fermilab programs can be safety accomplished without interruption.

The overall condition of the Laboratory's infrastructure is considered good, with an overall Facility Condition Index of excellent for buildings. The utility systems, however, are suffering age-related deterioration. Multiple GPP projects are planned to address these infrastructure needs over the coming years, specifically with respect to the high voltage electrical system, including feeders, as well as various water distribution systems.

Fermilab is meeting the day-to-day maintenance needs of the Laboratory infrastructure and better capturing investment data. Maintenance funding, as a percentage of conventional Replacement Plant Value (RPV), has increased in recent years and will likely be 1.8% in FY05. Current initiatives are being planned to further raise the Maintenance Investment Index (MII) to meet SC targets. For conventional maintenance and associated MII calculations, the inclusion of any portion of our accelerator asset in the RPV is not appropriate. Fermilab calculates MII based on all buildings & utility assets, including accelerator service buildings in the conventional RPV.

Deferred maintenance is largely comprised of building HVAC, roofing and other utility system needs. SLI Excess Facilities disposition funding has been used to demolish a number of small facilities.

Total Building Space (gross ft^2)	2,318,013 (4^{th} largest, SC)
Buildings	351 (2^{nd} largest, SC)
Largest Occupied Building (gross ft^2): Wilson Hall	522,986 gsf
Trailers, number of:	109
Real Property	8
Personal Property	101

Fermi National Accelerator Laboratory
2005 Facility Summary Overview

Wooden Buildings	157
Excess Facilities:	5
Uncontaminated	5
Contaminated	0
Replacement Plant Value (RPV): Total	$1,311,401,775
Programmatic (OSF 3000 category)	$745,748,925
Non-Programmatic (used for calculating Indices) (omits site prep catchall OSF)	$559,522,539
Landlord Program	High Energy Physics
Age of Buildings: Average (based on GSF)	32 years
% of space older than 40 years	14%
% of space 30 years or younger	64%
Maintenance Investment Index (MII)	
FY 03	1.42%
FY 04	1.7%
FY 05 (projected)	1.7%
Deferred Maintenance (DM) Trend	
DM 2002	$13,428,857
DM 2003	$15,398,941
DM 2004	$39,674,345
Total Summary Condition (DM+RIC) FY04	$75M
Deferred Maintenance (DM) FY04	$40M
Rehab and Improvement Cost (RIC) FY04	$35M
Total Summary Condition Index (TSCI) FY04	14.28%
Facility Condition Index (FCI) (buildings) FY04	1.69% (excellent)
Facility Condition Index (FCI) (utilities) FY04	28% (poor)
ACI (Asset Condition Index from RPAM Order) (1-FCI) (buildings) FY04	0.983 (excellent)
AUI (Asset Utilization Index from RPAM Order) (buildings) FY04	1.0 (excellent)
Leased assets	0

ACI	Asset Condition Index
AD	Accelerator Division
BSS	Business Services Section
CD	Computing Division
CD	Critical Design
CDF	Collider Detector at Fermilab
CDMS	Cryogenic Dark Matter Search
CEMP	Comprehensive Energy Management Program and Plan
CERN	European Organization for Nuclear Research
CFI	Conventional Facility Indicator
CMMS	Computerized Maintenance Management System
CMS	Compact Muon Solenoid
CPV	Capitalized Plant Value
CRD	Contractor Requirements Document
CUB	Central Utility Building
CY	Calendar Year
DEMP	Departmental Energy Management Program
DM	Deferred Maintenance
DOE	Department of Energy
DP	Director’s Policy
ELM	Environmental Land Management
ESH	Environment, Safety & Health (general practices) or Section
ESPC	Energy Savings Performance Contracts
FCC	Feynman Computing Center
FCI	Facility Condition Index
FCLUP	Fermilab Comprehensive Land Use Plan
FESS	Facilities Engineering Services Section
FESHM	Fermilab Environment Safety and Health Manual
FIMS	Facilities Inventory Management System
FNAL	Fermi National Accelerator Laboratory
FSO	Fermi Site Office
FY	Fiscal Year
GPM	Gallons per minute

GPP	General Plant Project
GSA	General Services Administration
GSF	Gross Square Feet
HDCF	High Density Computing Facility
HEP	High Energy Physics
HEPAP	High Energy Physics Advisory Panel
HQ	Headquarters (DOE)
HVAC	Heating, Ventilation and Air Conditioning
IFI	Integrated Facilities and Infrastructure
I&L	Industrial & Lab
ICW	Industrial Cooling Water
ILC	International Linear Collider
J-PARC	Japan's Proton Accelerator Research Complex
KV	Kilovolt
LHC	Large Hadron Collider
LSS	Laboratory Services Section
MARS	Maintenance and Repair Cost Forecast System
MINOS	Main Injector Neutrino Oscillation Search
MW	Megawatt
MVA	Mega Voltamperes
NGCF	Next Generation Computing Facility
NUMI	Neutrinos at the Main Injector
OECM	Office of Engineering and Construction Management (DOE)
OSF	Other Structures and Facilities
P5	Particle Physics Project Prioritization Panel
PPD	Particle Physics Division
PY	Previous Year
RIC	Rehab and Improvement Costs
RPAM	Real Property Asset Management
RPV	Replacement Plant Value
SC	Office of Science (DOE)
SCRF	Superconducting Radiofrequency Development & Test Facility
SDSS	Sloan Digital Sky Survey

TD	Technical Division
TEV	Tevatron
TYSP	Ten Year Site Plan
URA	Universities Research Association
VE	Value Engineering
WMAP	Wilkinson Microwave Anisotropy Probe

LIST OF FIGURES

	D/S	FIMS#	Building Name	RPV	GSF	Deferred Maint
MD	FE	001	Wilson Hall & Auditorium	$90,521,296	522,986	$817,929
	PD	002	Main Ring Gazebo	$12,560	628	$4,737
MC	CD	003	Feynman Computer Center	$13,264,365	81,472	$271,084
MD	LS	005	Science Education Center	$1,501,377	8,673	$519
	LS	019	11 Sauk Circle - Anderson Barn	$259,616	6,832	$2,905
	LS	020	1 Sauk Circle - Residence	$202,424	3,064	$2,076
	LS	021	3 Sauk Circle - Residence	$249,204	2,204	$539
	LS	022	4 Sauk Circle - Residence	$200,675	2,891	$0
	LS	023	5 Sauk Circle - Residence	$192,368	2,131	$808
	LS	024	6 Sauk Circle - Residence	$155,643	1,960	$1,298
	LS	025	7 Sauk Circle - Residence	$102,742	925	$4,380
	LS	026	8 Sauk Circle - Residence	$91,375	825	$1,557
	LS	027	9 Sauk Circle - Residence	$134,658	1,782	$269
	LS	028	10 Sauk Circle - Residence	$193,680	2,990	$1,108
	LS	029	12 Sauk Circle - Residence	$192,368	2,414	$1,698
	LS	030	13 Sauk Circle - Residence	$154,332	1,774	$3,058
	LS	031	14 Sauk Circle - Residence	$181,001	2,632	$8,808
	LS	032	15 Sauk Circle - Residence	$167,885	1,480	$1,504
	LS	033	17 Sauk Circle - Residence	$168,759	1,380	$7,708
	LS	034	18 Sauk Circle - Residence	$192,368	2,368	$8,374
	LS	035	19 Sauk Circle - Residence	$156,955	2,164	$808
	LS	036	1 Sauk Blvd - Aspen East	$153,020	17,117	$1,286
	LS	040	14 Sauk Blvd - Residence	$83,068	1,105	$779
	LS	041	16 Sauk Blvd - Residence	$83,068	1,105	$2,241
	LS	042	18 Sauk Blvd - Vending/Laundry	$83,068	1,105	$307
	LS	043	20 Sauk Blvd - Residence	$83,068	1,105	$1,546
	LS	044	1 Shabbona - Dorm 3	$166,136	3,200	$5,391
	LS	045	22 Sauk Blvd - Residence	$83,068	1,105	$2,644
	LS	046	24 Sauk Blvd - Residence	$83,068	1,105	$2,595
	FE	047	24a Sauk Blvd - Garage	$12,320	616	$260
	LS	048	26 Sauk Blvd - Residence	$83,068	1,105	$1,095
	LS	049	28 Sauk Blvd - Residence	$83,068	1,105	$1,230
	LS	050	28a Sauk Blvd - Garage	$8,860	443	$260
MD	FE	051	28b Sauk Blvd - Greenhouse	$83,068	1,920	$1,880
MD	FE	052	28c Sauk Blvd - R&G Equip Shed	$17,020	851	$1,078
	LS	053	29 Sauk Blvd - Residence	$83,068	1,105	$684
	LS	054	30 Sauk Blvd - Maid Hdqtrs	$166,136	1,600	$3,234
MD	LS	055	30a Sauk Blvd - Pole Building	$62,700	1,650	$434
	FE	056	31 Sauk Blvd - Pump House	$13,116	576	$269
	LS	057	32 Sauk Blvd - Dorm 1	$291,689	2,206	$269
	LS	058	33 Sauk Blvd - Residence	$83,068	1,105	$791
	LS	059	34 Sauk Blvd - Residence	$83,068	1,105	$2,212
MD	AD	060	36 Sauk Blvd - Metals Dev. Lab	$87,440	2,100	$539
MC	AD	061	Village FIRUS Hut	$36,920	120	$0
	FE	062	Village Water Facility	$5,000	1,310	$2,000

MC *Mission Critical,* MD *Mission Dependent*
** denotes Excess Facility*

	D/S	FIMS#	Building Name	RPV	GSF	Deferred Maint
	LS	069	2 Che Che Pinqua-Users Center	$334,208	9,522	$1,186
	LS	070	1 Che Che Pinqua - Kuhn Barn	$432,000	7,200	$4,726
	LS	077	13 Neuqua - Residence	$83,068	1,105	$223
	LS	078	16 Neuqua - Residence	$86,653	1,105	$753
	DI	079	18 Neuqua - Residence	$132,978	1,105	$856
	LS	080	19 Neuqua - Residence	$85,757	1,105	$643
MD	PD	081	20 Neuqua - Lab 7 House	$88,549	1,092	$0
MD	PD	082	22 Neuqua - Lab 7 House	$83,068	1,092	$0
	LS	083	23 Neuqua - Residence	$86,653	1,105	$519
	LS	084	25 Neuqua - Residence	$85,757	1,105	$2,731
	LS	085	14 Neuqua - Residence	$83,068	1,092	$1,078
MD	PD	086	26a Neuqua-Lab 6-Garage/	$12,960	648	$0
MD	PD	087	28 Neuqua - Lab 6 House	$83,068	1,092	$0
MD	PD	088	30 Neuqua - Lab 6 House	$83,068	1,092	$0
MD	PD	089	28a Neuqua-Lab 6 Pole Building	$166,136	1,650	$0
MD	PD	090	32 Neuqua - Lab 6 House	$83,068	1,092	$0
MD	PD	091	34 Neuqua - Lab 5 House	$83,068	1,144	$269
MD	PD	092	36 Neuqua - Lab 5 House	$83,068	1,015	$269
MD	TD	093	36a Neuqua - Lab 5 Pole Bldg.	$87,440	3,414	$26,347
MD	TD	094	38 Neuqua - Lab 5 House	$83,068	1,106	$20,539
MD	TD	095	36 Shabbona - Lab 5 House	$83,068	1,106	$20,000
MD	PD	096	26 Neuqua - Scintillator R&D	$909,235	2,200	$269
MD	TD	102	27a Winnebago - Lab 1 House	$83,068	1,092	$20,165
MD	TD	103	27b Winnebago - Lab 1 House	$83,068	1,066	$20,000
MD	TD	104	27c Winnebago - Lab 1 House	$83,068	1,092	$20,260
MD	TD	105	29 Winnebago - Machine Repair	$131,328	1,728	$8,310
MD	TD	106	32 Winnebago - Lab 4 House	$83,068	1,092	$15,519
MD	TD	107	35a Winnebago-Lab 2 Compressor	$83,068	629	$2,260
MD	TD	108	40 Shabbona-Lab 4 House/Office	$83,068	1,092	$15,000
MD	TD	109	30 Winnebago - Machine Repair	$229,824	3,024	$15,776
	LS	116	22 Blackhawk - Residence	$86,653	1,105	$779
	LS	117	24 Blackhawk - Residence	$86,653	1,105	$779
MD	PD	118	25 Blackhawk - Lab 8 House	$83,068	1,104	$539
MD	PD	119	25a Blackhawk - Lab 8 South	$1,245,521	1,738	$808
MD	PD	120	27 Blackhawk - Lab 8 House	$83,068	1,175	$539
MD	PD	121	29 Blackhawk	$84,520	1,178	$260
MD	PD	122	31 Blackhawk - Lab 8 House	$83,068	1,170	$1,374
MD	PD	123	31a Blackhawk - Lab 8 North	$88,334	1,650	$539
MD	PD	124	33 Blackhawk - Lab 8 House	$99,983	1,170	$808
	LS	125	35 Blackhawk - Residence	$83,666	1,105	$1,817
	LS	131	2 Shabbona - Dorm 2	$415,340	5,000	$269
	LS	132	8 Shabbona - Residence	$86,653	1,105	$779
	LS	133	8a Shabbona Garage	$8,000	400	$1,469
	LS	134	10 Shabbona - Residence	$86,355	1,105	$519
	LS	135	12 Shabbona - Residence	$84,562	1,105	$1,318

MC *Mission Critical,* MD *Mission Dependent*

** denotes Excess Facility*

	D/S	FIMS#	Building Name	RPV	GSF	Deferred Maint
	LS	136	14 Shabbona - Residence	$83,068	1,105	$1,590
	LS	137	14a Shabbona - Garage	$11,000	550	$1,536
	LS	138	19 Shabbona - Residence	$84,264	1,105	$791
MD	LS	139	20 Shabbona Shelter	$32,375	360	$269
	LS	140	21 Shabbona - House	$83,068	1,105	$1,886
	LS	141	Curia I-34 Shabbona, Day Care, Dorms 5,6	$1,612,584	20,995	$10,083
	LS	142	33 Shabbona - Residence	$85,159	1,105	$779
	PD	143	35a Shabbona - Lab 3 House	$83,068	1,092	$0
*	PD	144	35b Shabbona - Lab 3 House	$83,068	1,092	$21,598
*	PD	145	35c Shabbona - Lab 3 House	$83,068	1,092	$23,259
*	PD	146	35d Shabbona - Lab 3 House	$83,068	1,092	$26,582
*MD	PD	147	35e Shabbona - Lab 3 House	$83,068	1,092	$30,735
MD	TD	148	37a Shabbona-Material Dev. Lab	$87,440	2,030	$15,000
MD	TD	149	37 Shabbona-Material Dev. Lab	$131,160	1,080	$15,779
MD	TD	150	39 Shabbona-Material Dev. Lab	$83,068	2,219	$45,260
	LS	156	11 Potawatomi - Residence	$83,068	1,105	$2,501
	LS	157	12 Potawatomi - Residence	$83,068	1,105	$1,952
	LS	158	13 Potawatomi - Residence	$83,068	1,105	$2,187
	LS	159	14 Potawatomi - Residence	$83,068	1,105	$3,470
	LS	160	15 Potawatomi - Residence	$86,056	1,105	$2,425
	LS	161	15 A Potawatomi Garage	$8,800	440	$684
	LS	162	16 Potawatomi - Shower Rooms	$83,068	1,127	$358
	LS	163	16a Potawatomi - Exercise Rms	$93,894	4,614	$303
	LS	164	16b Potawatomi - Gynasium/	$207,784	7,320	$956
	LS	165	17 Potawatomi - Residence	$83,068	1,105	$1,971
	FE	166	17a Potawatomi Garage	$6,400	320	$260
	LS	167	18 Potawatomi - Residence	$83,068	1,105	$2,731
	LS	168	20 Potawatomi - Dorm 4	$118,044	1,667	$808
	LS	169	20-A Potawatomi Dorm 4	$83,068	1,105	$1,703
	LS	170	22 Potawatomi - Residence	$83,068	1,105	$1,557
	LS	171	24 Potawatomi - Residence	$83,068	1,105	$260
MD	TD	179	27 Winnebago - Lab 1	$550,131	11,748	$156,576
MD	TD	180	35 Winnebago-Lab 2 Butler Bldg	$358,114	9,892	$34,810
MD	PD	181	35 Winnebago - Lab 3	$743,040	10,960	$4,372
MD	TD	182	38 Shabbona - Lab 4	$641,835	11,714	$90,922
MD	PD	183	36a Shabbona-Lab 5 Butler Bldg	$650,212	9,600	$2,156
MD	PD	184	32a Neuqua- Lab 6 Butler Bldg.	$687,650	14,550	$71,971
MD	PD	185	22a Neuqua-Lab 7 Butler Bldg.	$707,284	9,600	$19,717
MD	PD	186	27a Blackhawk-Lab 8 Butler Bld	$642,540	11,938	$1,390
MC	AD	201	AP30 Service Building	$1,000,511	5,728	$2,078
MC	AD	202	AP10 Service Building	$1,000,511	5,728	$15,562
MC	AD	203	AP50 Service Building	$1,456,055	7,008	$2,560
MC	AD	204	AP-0 Target Hall	$2,371,222	8,176	$1,677
MD	AD	205	AP50 Gas Storage Building	$163,353	120	$26
MC	AD	206	Booster Gallery East & West	$2,879,147	23,160	$416,593

MC *Mission Critical,* MD *Mission Dependent*

** denotes Excess Facility*

	D/S	FIMS#	Building Name	RPV	GSF	Deferred Maint
MD	AD	207	Booster Tower Southwest	$2,184,296	14,560	$377,674
MD	AD	208	Booster Tower Southeast	$1,825,528	14,560	$397,969
MC	AD	210	MuCool Service Building	$1,882,387	2,580	$0
MC	AD	212	Linac, X-Gallery, Transfer Gallery	$35,956,835	123,587	$132,799
MC	FE	214	Central Utility Building	$30,669,102	16,398	$505,381
MC	AD	216	A0 Kicker Building	$372,666	1,704	$527
MD	AD	217	A0 Lab Building	$1,307,854	18,191	$34,198
MC	AD	218	A-0 Service Bldg./Vehicle	$1,043,597	4,056	$527
MC	AD	220	A-1 Service Building	$98,256	1,053	$593
MC	AD	221	A-2 Service Building	$98,256	1,053	$593
MC	AD	222	A-3 Service Building	$98,256	1,053	$323
MC	AD	223	A-4 Service Building	$98,256	1,053	$79
MC	AD	224	B-0 Service Building	$780,238	3,535	$3,385
MC	AD	225	B-1 Service Building	$98,256	1,053	$1,911
MC	AD	226	B-2 Service Building	$98,256	1,053	$900
MC	AD	227	B-3 Service Building	$98,256	1,053	$79
MC	AD	228	B-4 Service Building	$98,256	1,053	$618
MC	AD	229	B-48 Kicker Building	$58,364	512	$1,865
MC	AD	230	C-0 Service Building	$638,332	5,520	$1,779
MC	AD	231	C-1 Service Building	$98,256	1,053	$1,291
MC	AD	232	C-17 Kicker Building	$72,965	512	$1,078
MC	AD	233	C-2 Service Building	$98,256	1,053	$887
MC	AD	234	C-3 Service Building	$98,256	1,053	$456
MC	AD	235	C-4 Service Building	$98,256	1,053	$995
MC	PD	236	C-4 Pump House	$592,889	624	$869
MC	AD	237	C-48 Kicker Building	$98,787	512	$974
MC	AD	238	D-0 Service Building	$759,394	2,925	$973
MC	AD	239	D-0 Vehicle Access Building	$690,948	2,052	$1,347
MC	AD	240	D-1 Service Building	$98,256	1,053	$729
MC	AD	241	D-2 Service Building	$98,256	1,053	$887
MC	AD	242	D-3 Service Building	$98,256	1,053	$348
MC	AD	243	D-4 Service Building	$98,256	1,053	$348
MC	AD	244	D-48 Kicker Building	$72,964	512	$1,161
MC	AD	245	E-0 Service Building	$1,486,596	2,925	$2,479
MC	AD	246	E-1 Service Building	$98,256	1,053	$2,319
MC	AD	247	E-17 Kicker Building	$98,787	512	$1,347
MC	AD	248	E-2 Service Building	$98,256	1,053	$1,426
MC	AD	249	E-3 Service Building	$98,256	1,053	$1,157
MC	AD	250	E-4 Service Building	$98,256	1,053	$1,965
MC	AD	251	F-0 (Rf) Service Building	$6,293,022	20,816	$1,566
MC	AD	252	F-1 Service Building	$98,256	1,053	$1,938
MC	AD	253	F-2 Service Building	$98,256	1,053	$678
MC	AD	254	F-23 Power Supply Building	$79,796	880	$1,430
MC	AD	255	F-27 Power Supply Building	$134,423	880	$1,435
MC	AD	256	F-3 Service Building	$98,256	1,053	$1,083

MC *Mission Critical,* MD *Mission Dependent*

** denotes Excess Facility*

	D/S	FIMS#	Building Name	RPV	GSF	Deferred Maint
MC	AD	257	F-4 Service Building	$98,256	1,053	$618
MD	PD	258	D0 Gas Shed	$12,000	600	$539
MC	PD	259	B12 Gas Shed	$4,000	200	$434
*	AD	261	E0 Gas Shed	$1,920	122	$2,855
MC	AD	267	F-17 Service Building	$225,178	1,400	$0
MC	AD	283	Switchyard Service Building	$512,809	2,912	$44,844
MC	AD	299	A-1 Refrigeration Building	$37,750	211	$519
MC	AD	300	A-2 Refrigeration Building	$37,750	232	$363
MC	AD	301	A-3 Refrigeration Building	$34,801	153	$208
MC	AD	302	A-4 Refrigeration Building	$34,801	174	$156
MC	AD	303	B-1 Refrigeration Building	$34,801	174	$104
MC	AD	304	B-2 Refrigeration Building	$34,801	174	$104
MC	AD	305	B-3 Refrigeration Building	$34,801	174	$104
MC	AD	306	B-4 Refrigeration Building	$34,801	174	$519
MC	AD	307	C-1 Refrigeration Building	$34,801	174	$104
MC	AD	308	C-2 Refrigeration Building	$34,801	174	$260
MC	AD	309	C-3 Refrigeration Building	$34,801	174	$519
MC	AD	310	C-4 Refrigeration Building	$34,801	174	$311
MC	AD	311	D-1 Refrigeration Building	$34,801	174	$260
MC	AD	312	D-2 Refrigeration Building	$34,801	174	$1,505
MC	AD	313	D-3 Refrigeration Building	$34,801	174	$779
MC	AD	314	D-4 Refrigeration Building	$34,801	174	$519
MC	AD	315	E-1 Refrigeration Building	$34,801	174	$467
MC	AD	316	E-2 Refrigeration Building	$34,801	174	$415
MC	AD	317	E-3 Refrigeration Building	$34,801	174	$623
MC	AD	318	E-4 Refrig Bldg & Test Facility	$434,801	3,320	$1,505
MC	AD	319	F-1 Refrigeration Building	$34,801	174	$363
MC	AD	320	F-2 Refrigeration Building	$34,801	388	$623
MC	AD	321	F-3 Refrigeration Building	$34,801	254	$934
MC	AD	322	F-4 Refrigeration Building	$34,801	174	$519
MC	PD	323	Collider Detector Facility/Cdf	$11,244,276	41,914	$140,665
	AD	324	G2 Service Building	$206,365	1,700	$20,165
MC	PD	325	D-0 Assembly Building	$14,201,182	64,756	$71,352
MD	PD	326	PPD Office Building at D-0	$866,058	8,723	$0
MD	PD	327	PPD Office Buildings at CDF	$866,057	8,723	$0
	PD	330	C0 Experimental Hall	$2,303,352	7,740	$0
MD	AD	400	Meson Wonder Enclosure	$2,008,286	16,860	$908
MD	AD	402	Ms-1 Meson Service Building	$542,667	2,124	$1,581
MD	AD	404	Ms-2 Meson Service Building	$378,087	2,497	$147,483
MD	AD	406	Ms-3 Meson Service Building	$231,673	2,094	$51,318
MC	PD	408	Meson Detector Building	$18,330,114	32,091	$682,692
MD	AD	410	Meson Central Cryogenics	$438,218	3,961	$10,527
MD	PD	412	Meson Assembly Building	$1,619,360	13,750	$264
MD	AD	413	Shield Block Storage Shed	$258,979	24,130	$0
MD	AD	414	Meson Service #4	$176,859	902	$489

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	D/S	FIMS#	Building Name	RPV	GSF	Deferred Maint
MD	TD	416	Polarized Proton Lab - Mp	$2,466,569	13,005	$16,318
MD	AD	418	Meson Service Ms7	$353,410	2,233	$791
MD	AD	420	Meson West Lab -- MW9	$3,463,494	15,800	$15,264
MD	AD	422	BD Cryogenic Engineering Office	$661,715	4,821	$264
	AD	500	Proton Pagoda	$2,279,842	1,300	$50,108
MD	PD	502	Proton Assembly	$906,135	12,904	$2,897
MD	TD	504	Proton Tagged Photon Lab	$4,670,164	3,614	$7,827
MD	PD	506	High Intensity Laboratory	$2,673,157	6,654	$41,692
	AD	508	Proton Service #1	$967,895	3,213	$128,300
	AD	510	Proton Service #2	$1,047,215	682	$14,027
	AD	512	Proton Service #3	$1,782,177	2,414	$115,473
	AD	514	Proton Service #4	$338,625	2,782	$15,010
	AD	516	Proton Service #5	$180,739	3,192	$32,047
	PD	518	Proton Service #6	$44,428	1,302	$8,054
	PD	520	Proton Pole Building - Site 50	$97,888	2,576	$422
MD	PD	522	Exp Area Operations Ctr	$1,422,849	9,565	$19,481
MD	PD	600	Neutrino Lab A	$3,085,643	12,716	$2,447
MD	PD	601	Lab A-B Bridge Bldg	$908,312	6,840	$0
MD	PD	602	Neutrino Lab B	$1,885,588	10,679	$9,418
MD	PD	603	Rd T&M Shop	$43,776	576	$1,886
MD	PD	604	Neutrino Lab C	$1,840,711	5,190	$0
MD	PD	605	Lab C-D Cross Connect Building	$623,811	5,037	$0
MD	PD	606	Neutrino Lab D	$3,226,403	7,417	$0
MD	PD	608	Neutrino Lab E	$4,054,879	5,225	$527
MD	PD	609	Lab BEG Connection	$1,876,108	8,124	$0
MD	PD	610	Laboratory F	$1,292,780	15,799	$2,201
MD	PD	612	Laboratory G	$500,980	4,264	$1,344
	AD	613	Neutrino Service Building #E	$116,640	605	$1,078
MD	AD	614	Neutrino Lab Nwa	$2,656,655	8,000	$123,064
	AD	615	Neutrino Service #0	$333,720	480	$10,791
	AD	616	Neutrino Service #1	$328,961	3,320	$104,493
	AD	618	Neutrino Service #2	$209,586	1,272	$66,581
	AD	620	Neutrino Service #3	$231,099	1,236	$6,264
	AD	621	NS8 Service Building	$14,214	83	$0
	PD	622	Neutrino Service #4	$90,210	1,266	$1,318
	AD	623	Neutrino Service Building #7	$223,350	1,302	$3,129
MD	AD	624	Neutrino Target Service	$3,829,560	13,710	$13,360
MD	CD	626	Pb6/Pb7 Wide Band	$2,969,797	11,776	$57,573
MC	PD	628	Grid Comp Ctr - WBL Ctg House	$2,167,511	8,911	$692
	PD	630	KTeV / NM4	$7,492,736	13,054	$1,078
MC	PD	700	Muon Laboratory	$6,408,530	28,104	$3,752
MC	AD	708	MI 8 Service Building	$2,850,281	10,000	$269
MC	AD	710	MI 10 Service Building	$1,050,860	3,000	$269
MC	AD	712	Mini BooNE Target Hall & Serv Bldg MI 12	$3,128,156	3,010	$100,000
MC	AD	713	MI 13A Counting House	$25,000	104	$0

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	D/S	FIMS#	Building Name	RPV	GSF	Deferred Maint
MC	AD	720	MI 20 Service Building	$1,124,877	3,000	$269
MC	AD	730	MI 30 Service Building	$1,045,062	3,000	$269
MC	AD	731	MI 31 Service Bldg. E-Cool	$3,543,681	5,376	$0
MC	AD	740	MI 40 Service Building	$323,958	3,000	$269
MC	AD	750	MI 50 Service Building	$321,474	3,000	$269
MC	AD	752	MI 52 Service Building	$321,474	3,000	$269
MC	AD	760	MI 60 Service Building	$5,057,373	27,500	$434
MC	AD	762	MI 62 Service Building	$1,042,301	3,000	$539
MC	PD	780	Mini BooNE Detector Building	$745,297	4,465	$660
MD	TD	800	Industrial Building #1	$6,492,738	22,219	$39,967
MC	TD	801	Industrial Building #2	$4,269,655	28,988	$38,219
MD	TD	803	Industrial Shed #2A	$42,140	2,107	$4,746
MD	TD	804	Industrial Building #3	$3,288,540	18,888	$44,276
MD	TD	805	Industrial Building #4	$2,362,456	20,066	$36,389
MD	TD	806	Industrial Center Building	$5,124,885	45,117	$126,043
MD	TD	807	Industrl Compressor Bldg	$356,043	2,642	$23,375
MC	TD	809	Magnet Storage	$492,820	6,294	$26,038
MD	ES	840	Low Level Waste Handling Bldg.	$3,948,399	13,600	$1,483
MD	PD	849	Nevis Barn	$31,000	4,200	$0
MD	BS	850	Super Shed/Lundy Barn	$128,250	4,587	$3,018
MC	AD	851	Central Helium Liquefier	$3,773,283	25,673	$22,610
MD	ES	852	Pine Street Guard House	$13,483	80	$401
MD	BS	853	Railsiding Storage Shed	$10,500	525	$0
MC	FE	854	Master Sub-Station	$245,640	4,376	$1,903
MC	FE	855	Caseys Pond Pump House	$1,187,605	496	$2,806
MD	ES	856	Batavia Road Guard House	$8,724	32	$808
MD	ES	857	Wilson Rd Guardhouse	$8,724	32	$0
MC	FE	860	Kautz Road Sub-Station	$530,180	3,500	$276
MD	FE	902	Site 3 Barn	$311,448	8,196	$2,156
*	FE	903	Site 3 Storage Building	$3,000	122	$1,200
MD	FE	904	Site 3 Shed	$36,000	1,800	$539
	FE	906	Site 12 Barn	$346,560	9,120	$62,156
MD	AD	911	Site 17 Barn	$177,536	4,672	$1,078
MD	AD	912	Site 17 Shed	$72,000	3,600	$1,347
	LS	914	Site 29 House	$87,440	5,327	$0
	LS	916	Site 29 Garage	$23,740	1,187	$1,455
	LS	918	Site 29 Shed 1	$34,580	1,729	$269
	LS	920	Site 29 Shed 2	$33,180	1,659	$1,347
MD	FE	921	Site 37 Shop	$644,557	17,500	$11,818
MD	FE	922	Site 38 Maintenance	$240,375	14,518	$13,706
MD	FE	923	Roads/Grounds Equip Stge	$161,490	6,282	$2,140
MD	FE	924	Site 38 Equipment Building	$117,990	3,105	$660
MD	FE	925	Salt Storage Facility	$168,616	3,045	$260
MD	FE	926	Site 39	$1,911,836	15,649	$2,501
MD	FE	928	Site 38 HUS Building	$91,200	2,400	$2,044

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	D/S	FIMS#	Building Name	RPV	GSF	Deferred Maint
MD	BS	929	Fuel Service Center	$1,175,835	1,904	$264
MD	FE	930	Site 38 Barn	$430,064	17,424	$102,308
MD	ES	931	Radiation Physics Calibration	$616,944	5,736	$6,746
MD	ES	932	Site 38 Fire Station	$406,657	5,183	$2,537
MD	ES	934	Site 38 Extinguisher Bldg	$43,273	580	$264
MD	BS	936	Site 38 Hazardous Storage	$85,600	4,280	$264
MD	BS	938	Receiving Warehouse #1	$2,679,177	40,000	$2,723
MD	BS	940	Receiving Warehouse #2	$1,109,987	42,800	$201,661
MD	BS	941	Scale House	$38,000	192	$269
MD	PD	942	Site 49 Barn	$344,394	9,063	$46,595
	FE	943	Site 50, Building A	$14,326	377	$7,800
MD	FE	944	Site 50 Barn	$112,176	2,952	$65,700
	LS	946	Site 50 House	$300,200	3,950	$23,725
	FE	947	Site 50, Building C	$24,928	656	$2,539
MD	ES	948	Site 52 House	$294,576	3,876	$973
	FE	949	Site 52 Barn	$232,560	6,120	$6,071
	ES	950	Site 52 Shed	$3,200	160	$269
*	FE	951	Site 50 Shed D	$5,775	109	$1,469
	LS	964	Site 55 House	$278,236	3,661	$3,294
MD	FE	966	Site 55 Storage	$98,256	1,242	$1,868
MD	FE	968	Site 55 Garage	$16,000	800	$434
MD	ES	970	Site 55 WS-3 Waste Storage	$122,045	2,219	$0
MD	ES	972	Site 55 WS-2 Waste Storage	$96,333	1,740	$0
MD	ES	974	Site 55 WS-1 Waste Storage	$99,935	1,817	$0
	LS	976	Site 56 Residence	$221,312	2,912	$1,054
	LS	978	Site 56 Barn 1	$36,480	960	$20,211
	LS	980	Site 56 Barn 2	$77,786	2,047	$12,461
	LS	982	Site 56 Shed 1	$31,500	1,575	$1,078
	FE	983	Site 56 Storage Building	$5,000	180	$200
	LS	984	Site 56 Shed 2	$107,700	5,385	$808
	LS	986	Site 58 Residence	$280,972	3,697	$949
	LS	988	Site 58 Barn	$47,880	1,260	$0
MD	FE	992	Site 65 Barn	$291,840	7,680	$12,000
*MD	FE	993	Site 65 Storage Building	$3,000	108	$1,000
MD	AD	994	Site 67 Barn	$281,770	7,415	$15,687
MD	FE	998	Site 70 Barn	$242,364	6,378	$1,078

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CROSSWALK – SC Guidance & TYSP Contents

Ten Year Site Plan

Fermilab TYSP		*SC Guidance*	
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APPENDIX

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